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Canada's Personal Computing Magazine

October 1985

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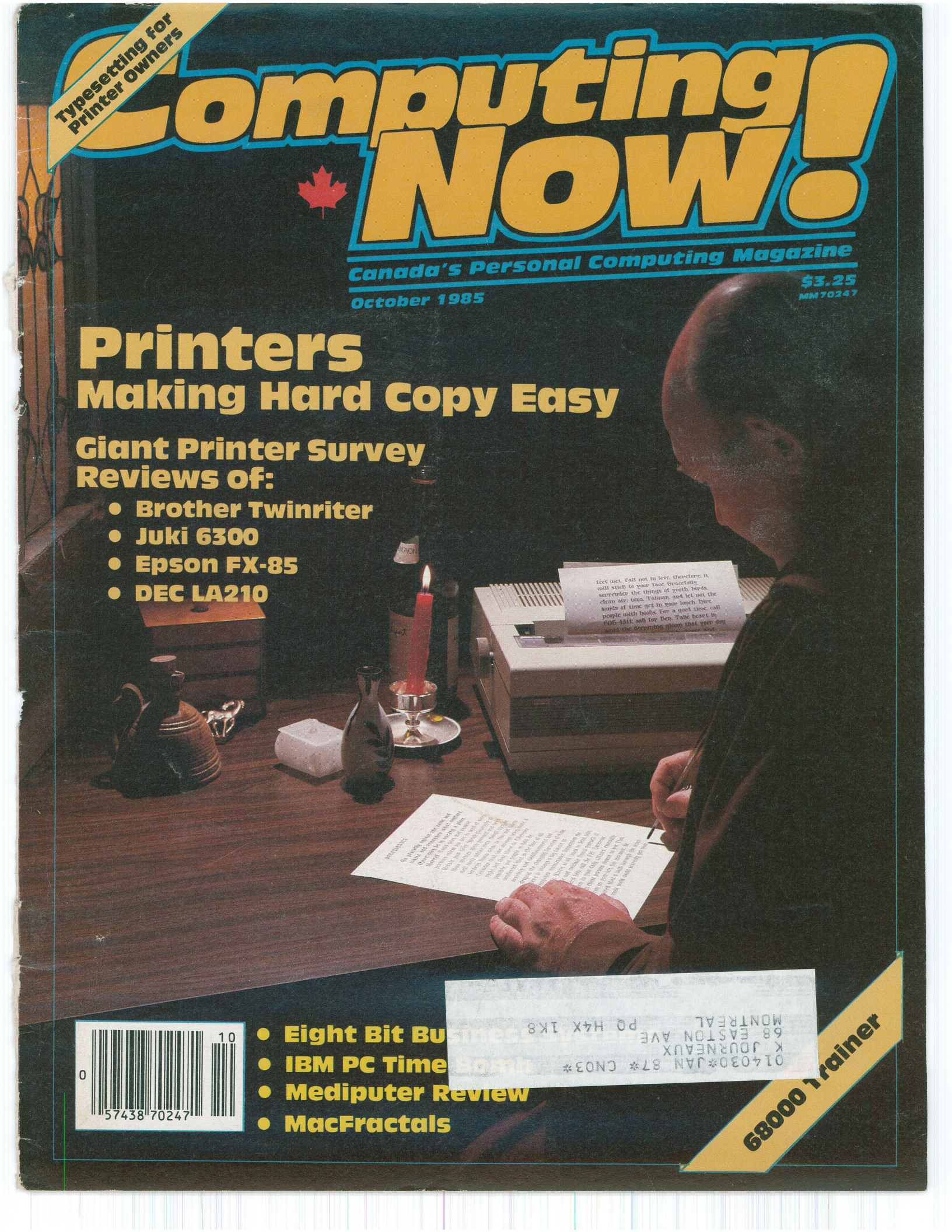

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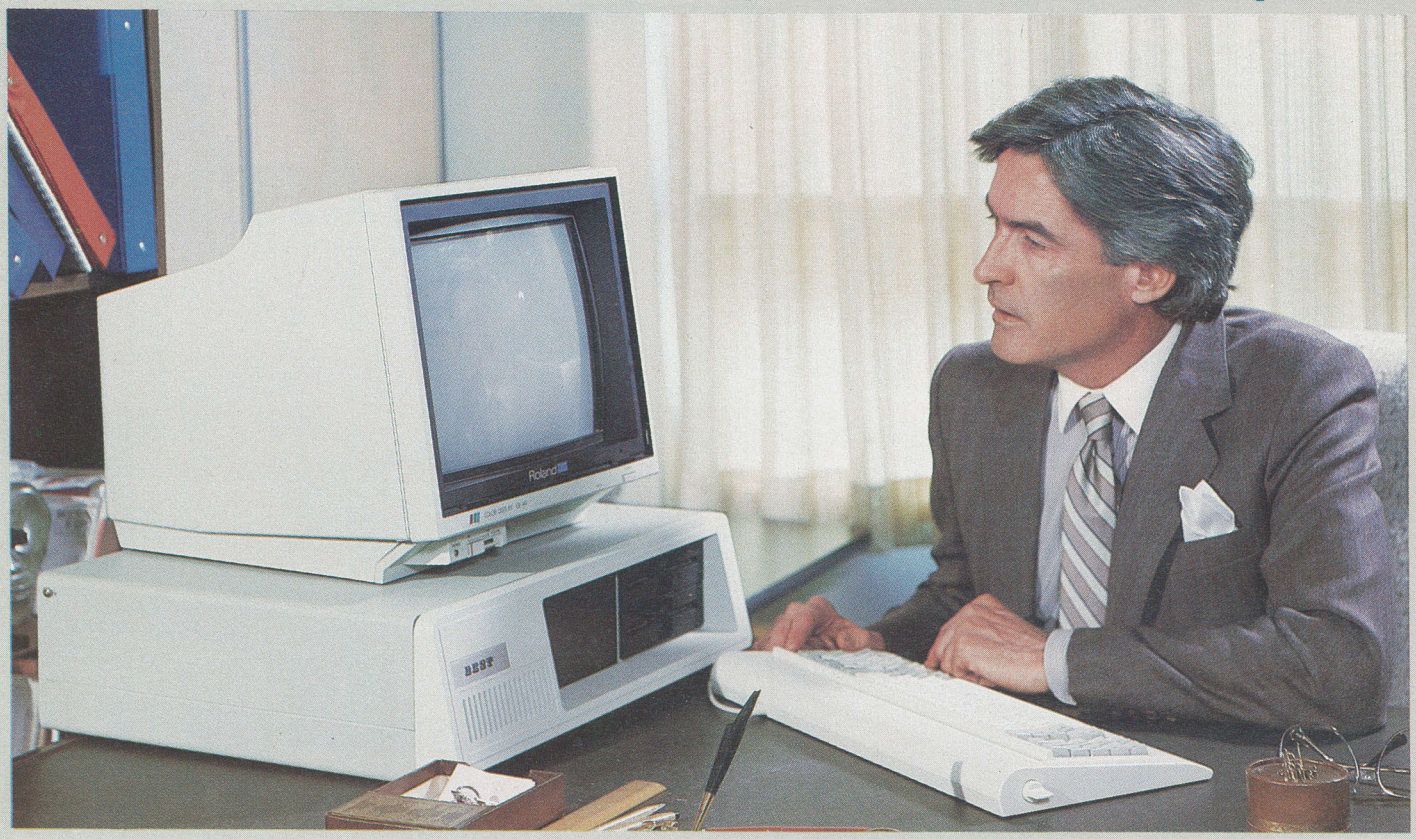

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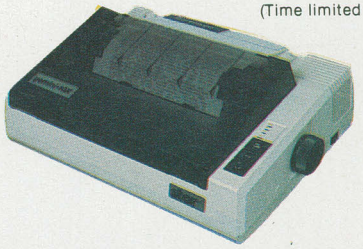

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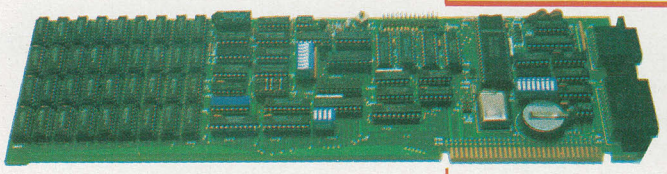

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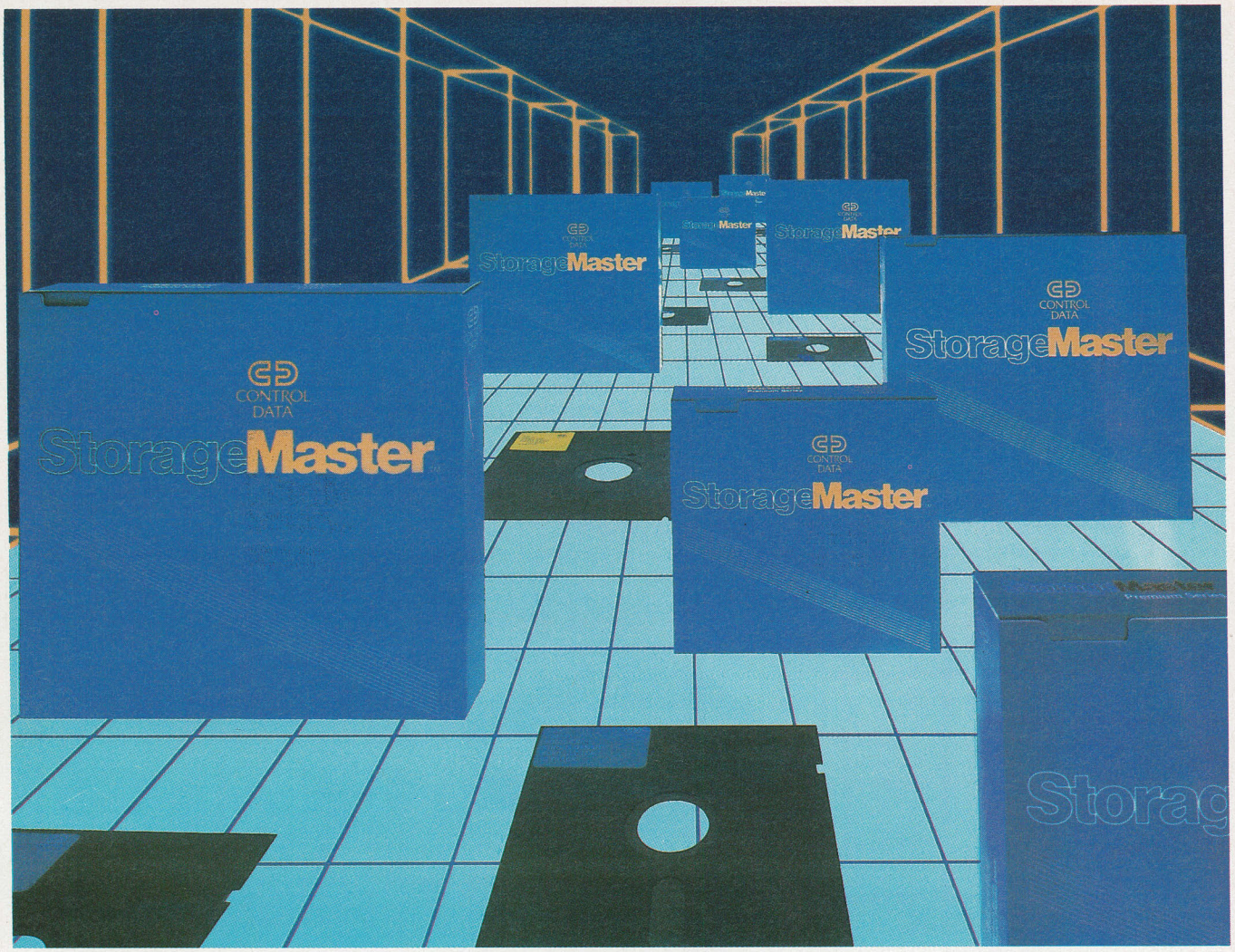

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EDITOR
Steve Rimmer

ASSISTANT EDITOR
Marie Hubbs

DIRECTOR OF PRODUCTION
Erik Blomkwist

CREATIVE MANAGER
Ann Rodrigues Maia

PRODUCTION
Douglas Goddard
Naznin Sunderji
Sandra Hemburrow

CIRCULATION MANAGER
Lisa Salvatori

ACCOUNT MANAGER
Denis Kelly

Toronto (416) 423-3262
Montreal (514) 735-5191
Vancouver (604) 688-5914

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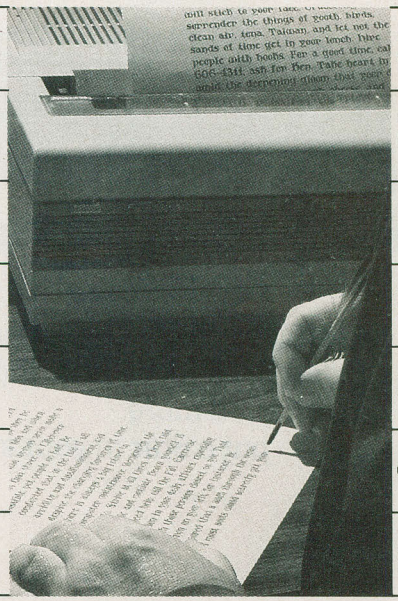

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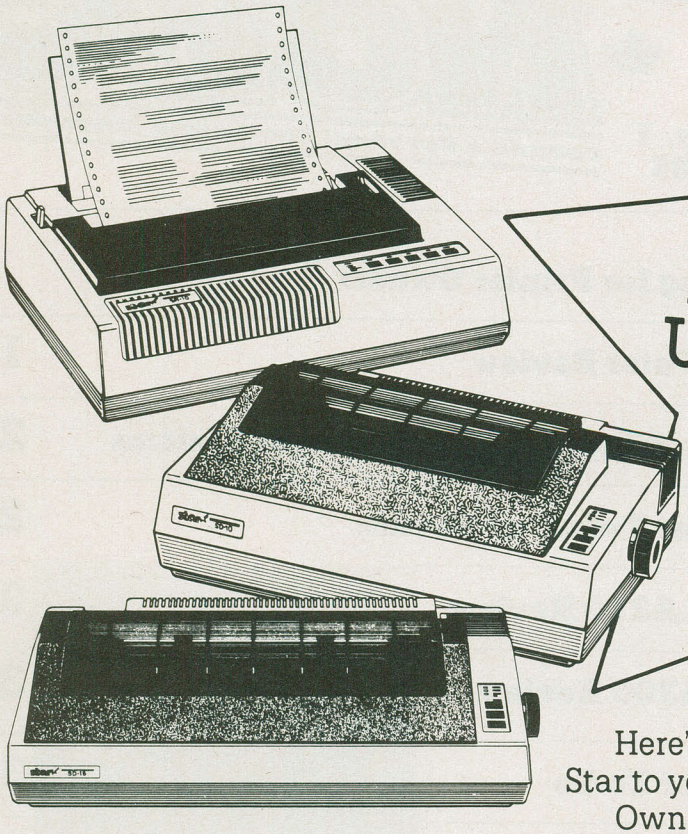

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COMPUTER PRESS

by Marie Hubbs

Canada Remote Systems Limited, one of Canada's largest suppliers of public domain software, has expanded its services to include the Mac, adding over twenty megabytes of public domain Macintosh software to their library. For an annual membership of thirty-five dollars Canadian, CRS provides access to their remote systems, a bi-monthly newsletter and all the public domain software you can download over the year. Non-members can obtain disks for between ten and fifteen dollars each.

For further information and a free mini-catalogue, contact Canada Remote Systems, 4691 Dundas Street West, Islington, Ontario M9A 1A7, telephone (416) 239-2835.

Claimed to be the largest acquisition in microcomputer software history, *Ashton-Tate* announced that it has signed a letter of intent to purchase Multimate International of East Hartford, Connecticut, the producer of one of the best selling word processing packages, Multimate Professional word processor. Completion of the sale will make Ashton-Tate the second largest software company in the world, with such major best sellers as dBASE III and Framework, the latter obtained earlier this year with the purchase of its publisher, Forefront Corporation of Sunnyvale, California.

Ashton-Tate can be reached at 10150 West Jefferson Boulevard, Culver City, California, 90230, telephone (213) 204-5570.

Touted as the the first world-wide simultaneous onsite online computer conference, *The World Logo Conference* will take place October 25, 26 and 27 in Vancouver, British Columbia. Through the facilities of Compuserve Information Services, anyone in North America can be an active participant, sharing Logo programs and establishing contact with individuals or groups interested in the study and implementation of Logo. Sponsored by the B.C Logo Users Group in co-operation with the Faculty of Education, Simon Fraser University, registration is $15.00 Canadian to Compuserve members, and $55.00 to non-members.

For more information and registration, make cheques payable to "World Logo Conference", 1616 Charles Street, Vancouver, British Columbia, V5T 2T3.

More for the Mac

● Called the world's first **Macintosh integrated digitizer**, *GTCO Corporation*'s Macintizer avoids some of the flaws of the mouse and expands the graphics capabilities of the Mac. The patented electromagnetic digitizer plugs directly into the mouse port, making modifications to the operating systems and applications software unnecessary. The Macintizer's scanning sensing system works through dirt and contamination that would clog a mouse, won't skip like a mouse can, and uses absolute co-ordinates which eliminates the occasional "lift and shift" incurred with the mouse's relative co-ordinates. The pen shaped stylus facilitates natural and precise drawing on the electronic work surface.

Retail price in the States is under six hundred dollars. For more information and Canadian prices, contact InterworldElectronics and Computer Industries, 1442 Pemberton Avenue, North Vancouver, British Columbia V7P 2S1, telephone (604) 984-4171.

● Built to fit right under your Mac, the Macbottom is a **high capacity hard disk drive system** that gives you over ten megabytes of storage space while taking up no extra desk space at all. Including such features as automatic turnon, connection to either modem or printer port, a backup program and a printer spooler, the Macbottom has its own 68006 CPU and RAM so that there is no extra load placed on the Mac's own CPU.

Listing for just under three thousand dollars Canadian, the Macbottom is available from *Computron*, 55 Torbay Road, Units 1 and 2, Markham, Ontario L3R 1G7, telephone (416) 477-0828.

● Max, a 256K expandable **printer buffer** for the Macintosh is now available from *Dataspace*. Retailing for around $750.00, Max is also AppleTalk compatible, allowing several Macs to make maximum efficient use of one printer. Dataspace can be contacted at 205 Riviera Drive, Unit #9, Markham, Ontario, L3R 2L6, telephone (416) 474-0113.

● Expanding the networking capabilities of the Macintosh even further, the EtherMac line of products from *3Com Corporation* **allows Macs to share data between AppleTalk users and IBM PCs**, connects separate AppleTalk networks and permits the sharing of printers. Within the EtherMac line various configurations are available, including products such as EtherShare, EtherPaint and Server. For prices and further information, contact 3Com Corportation, 1365 Shorebird Way, P.O. Box 7390, Mountain View, California, 94039, or call Derek Brown at (415) 960-9451.

Continued on page 75

Next Month In

Computing Now!

Telecommunications

The November issue of Computing Now! will feature a complete look at telecommunications. We'll be checking out business databases, those powerful on line system which allow one to access a multitude of information at the touch of a carrier button. We'll also be surveying modems, and looking at some of the latest technology in these sophisticated peripherals.

The Operator for IBM PC's

Given that you have a suitable modem attached to your PC, you can turn it into the most sophisticated voice dialing system immagineable. Next month we'll be doing a program that will keep track of your phone directory and dial it for you... all without tying up your computer.

Law on Line

In the next edition of Computing Now! we'll be looking at some of the uses to which microcomputers are being put by the legal profession. Included in it will be a review of the on line legal databases and law related systems, which can avail lawyers and law students of a variety of information by modem.

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Typesetting for Printer Owners

You don't have to be a publisher to appreciate the advantages typesetting can bring to your business documents. Whether you're generating reports, preparing news letters or selling used cars, a basic understanding of type and possibly a working relationship with a typesetting house will make your stuff look a lot slicker.

by Steve Rimmer

Typesetting is one of the most interesting funky old technologies around. While the machines that we relate to it clawed their way to the surface of the oozing swamp in the latter part of the last century, the basis of it all started with Gutenberg and his contemporaries.

If you are just getting your head around everything that can be done with a dot matrix printer some of the subtleties of type may escape you. However, there are a number of fairly profound things happening in the art of type, some of them quite important to the eventual effectiveness of what one is laying on paper.

In stretching out one's fingers beyond the placid shores of mere printouts, one is confronted with varying degrees of slickness in getting text onto a printed page. There are, of course, various font generators and print enhancers. There are also systems like the Apple Macintosh and the Commodore Amiga that will do all sorts of clever things with fonts, to the extent of almost making it as *bona fide* typesetters in their own rights. Finally, there is on line computer typesetting, which can give one most of the joy of real type without actually having to buy a thirty thousand dollar lamp stand.

In this feature we're going to look at some of the nuances of type, how to use them and, perhaps most important, how to get them onto paper.

Hot Lead

The typesetters of the turn of the century, usually called Linotype machines after the company which built them, were pretty wild affairs that created type by pouring hot lead into moulds and sliding the resulting slugs into long trays, called *galleys*. This isn't really all that germane to this feature except to note that much of the current generation of typesetting equipment is still based on the concepts and, most important, the terms which were introduced with the Linotype machines.

By the way, Linotype still make typesetting machines... although they don't involve hot lead any more.

The measurements used to describe type are as archane as the machines that used to produce it. The width of a line of type is measured in *picas*. There are six picas to an inch... you can work out what that would be in metric if you're really into government mindwash. The height of the characters is measured in points. Normal typewriter characters are usually ten or twelve points high. To further confuse the issue, the space between the lines of type is also measured in points. This space is referred to as the *leading*, for the obvious reason that they used to pad out the lines with slabs of lead.

The type you're reading is described as being *nine on ten*, which means that it's nine point type on ten point leading.

Picas are divided into twelfths when one wants to talk about fractions of them. This article is set in type thirteen and a half picas wide, which would be expressed as 13.06, or thirteen and six twelfths.

Typefaces in typesetting are called *fonts*. This is from the latin *funditus*, which means "a casting". This relates back to the hot lead typesetters.

For reasons we'll get to in a while, it's usually the case that a typesetting machine can offer one only a limited selection of fonts at any one time. Ours, for example, can hold four. However, this is always further restricted to two pairs of related faces. One might have medium type... what you're reading now... and its itallic as one pair and bold type... such as in the sub-heads of this article... and its itallic as the other.

Our Compugraphic typesetter.

Type is generally proportionately spaced, which means that each letter takes up a portion of the line it's sitting on in proportion to its size. Thus, for example, the space allowed for an "i" is much smaller than that of an "m". By comparison, a typewriter produces uniformly spaced type.

Proportional spacing allows one to get a lot more type on a page than one could with a normal daisy wheel. One of our magazine pages can encompass as many characters as four or five typewritten pages. Proportional spaced type also looks better and is easier to read.

The normal mode of most typesetters is to justify both columns of whatever they set. This is called justified type... it's what you're reading now. However, one can also have *flush left*... or *ragged right*, which is what typewriters generally produce. The opposite of this, *flush right* or *ragged left*, isn't usually seen except as a special effect. The final variation, centered type, can be thought of as a combination of the two.

Left to its own devices a typesetter will pad out any line it is given until it goes clear across the column. This is fine... except for the ends of paragraphs, wherein it will space out three or four words to fill a whole line if needs be. For this reason, in order to define the end of a paragraph as being essentially a flush left line in an otherwise justified column one tells the typesetter that this line is *quad left*. A *quad*, or *quadrat*, used to be a chunk of lead that one jammed in behind short lines of type.

A centered line, then, is referred to as *quad centre*.

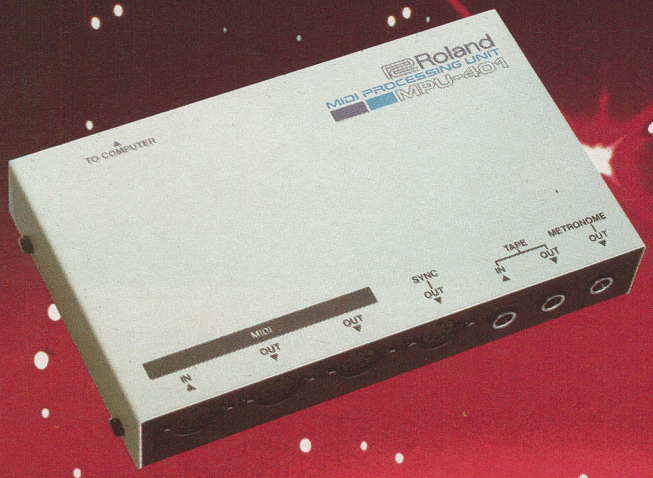
Our Compugraphic 7300 typesetter, while a bit dusty by the standards of some of the really hot new systems that have emerged in recent years, is typical of the way most typesetters function. It's a *phototypesetter*... perhaps the most bizarre form of printer one is likely to encounter. It creates type by spinning a strip of plastic around on a drum and blasting a strobe tube through negatives of the characters it wants to print at just the right instant as the type swings by. The type comes up on photosensitive paper which can then be processed and stuck down.

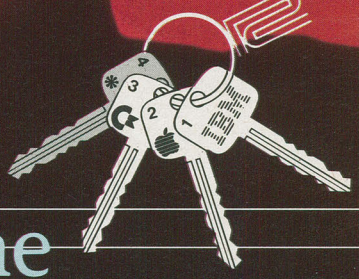
Not surprisingly, typesetters are essentially very specialized computers. Our system is based on 8080s, the very early precursor to the chips that now infest IBM PCs. They handle data in ways that are analogous to the way a computer running a word processor would, although it's not uncommon to find that there are some very radical differences in the actual implementation of the details. Our system, for example, doesn't use ASCII, but, rather, a code standard all its own. We call it *Compugraphscii*. It has its own bizarre disk operating system and format... on freaky hard sectored disks... and lots of very peculiar control characters which handle all the complex effects that the typesetter can render on paper.

This last fact is extremely important, because it means that typesetters can conceivably accept ASCII text from a word processor and render it as type. Some systems are actually designed with this in mind, so that "on line" typesetting is a feature which many large typesetting houses offer.

If you give your text to an on line typesetter it will give you what is effectively

Roland





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a typeset printout. Most typesetting houses which do this sort of thing will apprise you of the codes you'll have to use... they vary a lot from system to system. In many cases you can send your text over the phone through a modem and have type back in a couple of hours.

The best way to find a typesetting house that will handle this sort of thing is to start with T in the yellow pages.

Type Casting

Whether you elect to have your text files typeset or merely get into some fancy dot matrix fonts, being able to use typesetting effectively involves some knowledge of typefaces and the subtleties thereof. In the rudest sense type is just characters that form words, but, if typesetting is really going to work for you, you have to get your head into the idea of designing pages.

Let's begin with the type itself. There are hundreds of type faces extant on the planet. They all have names and they've all been designed for specific reasons. Some of the reasons were a little squirrely to be sure... many of the typefaces which exist probably shouldn't.

The typeface you are reading at the moment is called Stymi light. It's a *serif* face, which means that there are little pointy bits on the edges of the letters. If the pointy bits weren't there it would be called a *sans serif* face. The pointy bits were originally put on type so that when the slugs were getting knocked about the corners of the characters would hold up better. However, there is a definite difference in the way we perceive serif and sans serif faces.

A serif typeface looks a lot more readable. People normally associate this sort of type with text that's read for pleasure, as opposed to sans serif faces, which are usually found in technical journals and advertisements. If one were doing a newsletter one would probably want to use a serif face. A business report would do better in a sans serif face.

Stymi is actually a fairly unusual serif face, in that its characters are made up of lines of fairly uniform width. Many of the serif faces one comes across are modeled on the typeface *Press Roman*, which has lines that bulge out here and there. Variations on Press Roman are almost universally found as the typefaces of newspapers. It's arguable that these are the most readable typefaces, although some people regard them as being a bit dated in appearance.

The sans serif face that is most commonly found is called *Helvetica*.

By the way, it's worth noting that typefaces and their names are usually copyrighted by the heads who create them... designing type, far from being a matter of a few hours with the font editor on a Macintosh, is a very exacting art if one's type isn't to come out looking like ransom note deluxe.As such, it's often the case that typesetter manufacturers who don't want to pay for the licence to a popular typeface, or for some reason simply can't obtain it, will create an almost identical face with a sort of similar name. Thus, for example, our Compugraphic calls Press Roman *English Times* and Helvetica *Helios*.

One of the very important aspects of type that escapes most people who get multiple fonts for their printers is that type comes in two very distinct sorts. The type you are reading is called body copy. The type one uses for headlines or other large print is called display type. Never the twain shall meet.

Body copy type faces are characterized by relatively skinny lines and a lot of air... open space... between the characters. Display faces have opposite features. They're intended to attract a lot of attention, so they scream out at one with a lot of black. Simply blowing a body copy typeface up to display face proportions won't cut it... there are subtleties of one which make it unsuitable for the work of the other. Display faces shot down to be used as body copy are far worse, usually bordering on the unreadable.

In many cases there are complimentary versions of a typeface to be used as body and display type. For example, Stymi comes in light, medium and bold for body copy and extrabold and extrabold condensed for use as a display face.

There are a number of useful guidelines to bear in mind when specifying type. Everything you do should be designed to make the design of the page say what you want it to say. One of the fundamental areas in page design concerns the use of fonts.

A typesetter's keyboard.

As a rule of thumb, no page should have more than two fonts on it, one of which should be a display font and the other a body copy font. You can have several sizes of each, and variations on them, such as medium, itallic and so forth, but having a multiplicity of fonts generally makes your pages look like ads for the circus.

The ideal page design has its purpose in large characters... the title, a hook to get people to read the thing and buy stuff, an introduction and so on... and then its message in body copy text. However, you can meddle with this quite a bit depending on what you're doing.

Obviously, some things should look like ads for circuses. If you're working for Ringling Brothers much of this stuff will be meaningless to you.

Another characteristic of type is that it looks much denser than does dot matrix print. As such, setting a whole page of body copy can create a "wall of type" that looks a bit intimidating to a reader. If you're generating a business report this doesn't matter... business reports look like heavy reading but their readers expect this. Newsletters and flyers, on the other hand, should be broken up with headlines and larger type... perhaps a few illustrations if you can get it together... to make them look less thick.

Finally, people who get into typesetting from the Macintosh end... that is, wherein having multiple fonts, many of them weird, is fairly simple... often get into really bizarre typography. There are many typefaces which are peculiar looking or specific to some industry. The Byte 77 face... which we all recognize as computer type... is grossly over used in advertisements and other computer related literature. In most cases it's fair to say that sort of conservative typefaces will make your pages look a lot better than really weird ones, even if you happen across a weird one that seems to fit your application.

Words and Pictures

The principles of typesetting and page design apply to creating documents whether you are doing them with a font generator on a dot matrix printer or you're working with a typesetting house. The latter approach, however, is one which bears consideration for many of the things traditionally done on printers. Typesetting is cheap, fast and looks worlds more professional than anything that's done by a computer alone. More to the point, type is simply more readable than dot matrix print, even great dot matrix print. In a world where the people you want to reach probably haven't got time to read a tenth of what they're offered, having this sort of an edge is worthwhile.

Most typesetting houses with the facility to take computer data will accept files over the phone or on a wide variety of disk formats. Many will code the files for you, although it's usually the case that coding

GhostBusters

Typesetting machines are among the most easily haunted sorts of technology. There are theories that this is due to the fairly intensive processor activity involved in setting type. The microprocessors generate a lot of heat, the heat, in turn, calls for numerous vent openings and this leaves easy access for ghosts, unhappy spirits, poltergeists, gremlims and other unwanted ectoplasm.

Removing these spirits from a typesetting machine can now be accomplished through the use of a simple software package. The *Disk Exorcisor* will rid any computer typesetter of all hauntings in less than two minutes. It's available for most popular machines.

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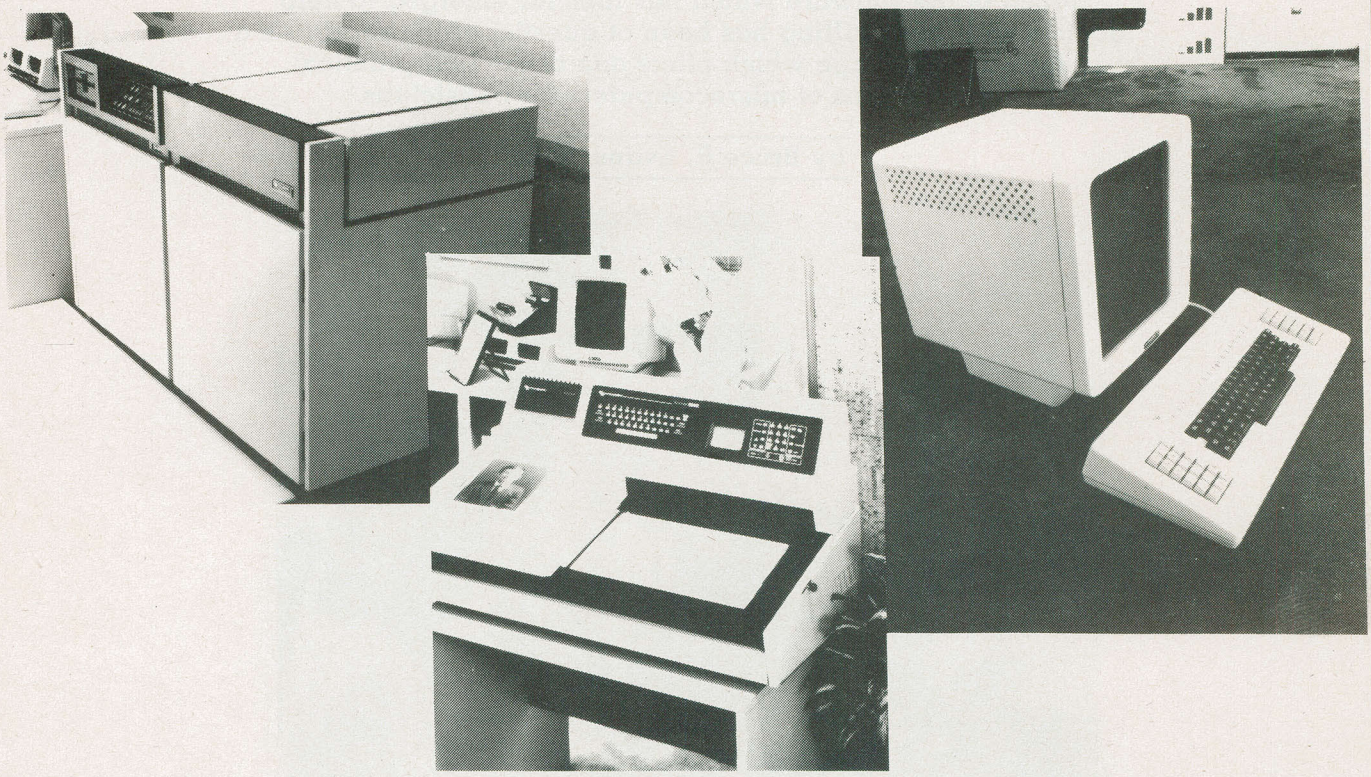
This is type in Helvetica and Press Roman as rendered by a printer and a typesetter. The printed version is from Kensington Microware's Professional Macintosh Fonts, to be seen in the next Computing Now!.

them one's self isn't that much of a task. It'll generally make your type show up that much quicker and give you greater control over what you can make the typesetter do.

The nuances of typography are a powerful tool if you can get your head into making them talk for you. You can tell people a lot about what you're saying in a document long before they read a single word. After a while you'll be able to spot the typefaces in magazines and you'll find yourself afflicted with all sorts of things that bother editors.

"Hey, Martha... lookit this. They've used Press Roman for these headlines... hey Martha... wake up, Martha, I'm talkin' to ya..." **CN!**

It All Started with a Compugraphic Editwriter 7300



Typesetting is a unique technology. So much of it is based on inventions and terminology of the last century. However, microprocessors and digital technology are what bring it in reach of individual publishers.

In house typesetting is unquestionably one of the greatest assets a publisher can have. It avails one of inexpensive type when it's needed, the flexibility to change things at the last minute, and, most important, complete control over *the* most critical aspect of producing magazines.

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In more recent years we've expanded the facilities of our hardware considerably. It has a computer front end to allow us to set word processing files directly. We've added new typefaces to give us greater flexibility in the styles of our magazines. We've even set up the system to allow it to set type at night to make more efficient use of our resources.

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Our Compugraphic equipment is one of the fundamental resources which make it possible to produce the magazines that we do. And, while you probably just know us for the magazine that you're reading now, we are, in fact, among Canada's largest publishers of specialty magazines.

We wanted to recgonize Compugraphic in this issue on typesetting. This is our way of doing it and suggest you call them if you have typesetting needs. We've seen enough to recommend them.

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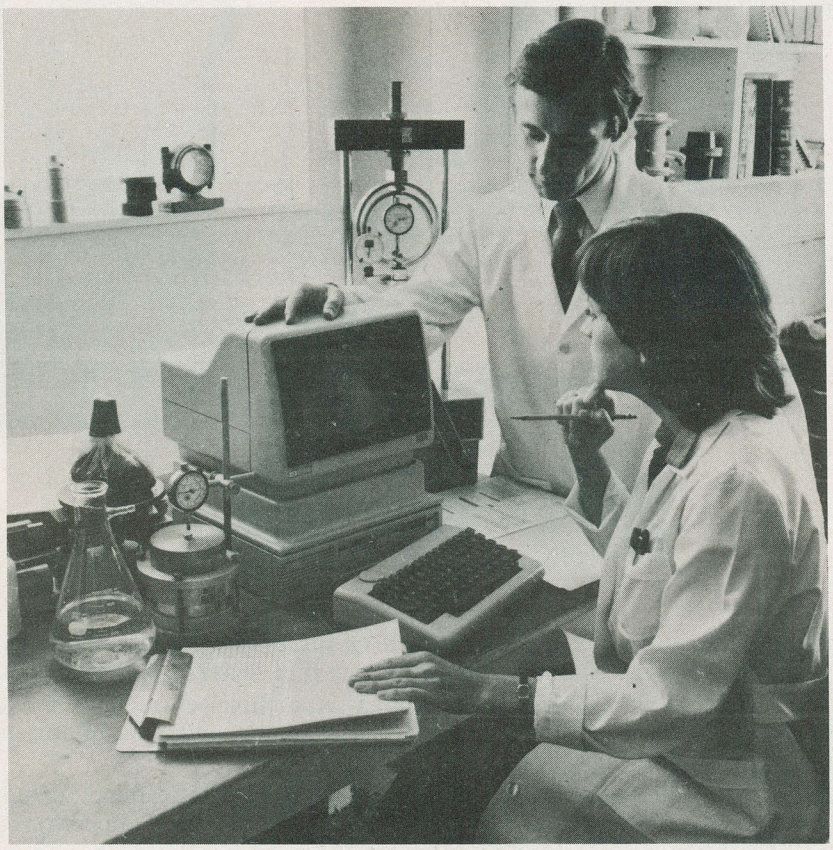
The Mediputer Review

Much of the software which has thus far emerged to help doctors with their billing has been of questionable use. Here's a look at a package which offers one of the first practical applications of microcomputers for physicians.

by Bruce R. Evans, M.D.



One might well ask what a medical office management system *should* do. As I mentioned in my article, Doctor's Little Black Computer, in May 1984 Computing Now!, there are three main areas. These are billing, accounting and everything else. "Everything else" may not sound very specific. It isn't. Every doctor has his own idea of what a computer in his office should do. This varies from payroll to appointment making to doing epidemiologic research. Therefore, the way to pick a system is to find one that does the first two things and then add some bells and whistles.

One of the best billing systems I've seen is Mediputer by Small Business Computing Limited. This company as been selling its billing program to chiropractors since 1979. Today, more than two hundred chiropractors in Ontario are using it. Craig Curphey, the president of Small Business Computing, has redesigned this program for medical practitioners. It can handle from one to seven physicians and a total of thirty-three thousand patients. Presently, there are versions for the IBM XT and IBM AT.

I tested a version on an XT but I was successful in running parts of it on my Heathkit HS-151, an IBM compatible without a hard disk.

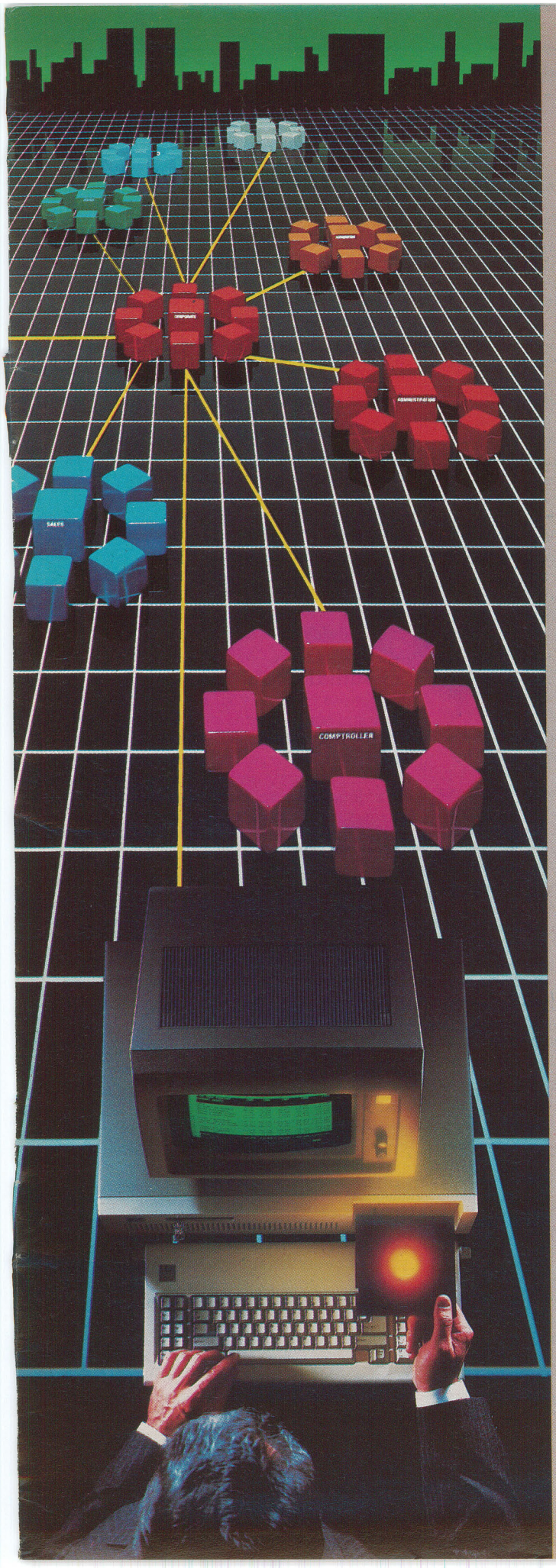
The Doctor's Bill

A good billing system should be able to keep track of all my patients and their billing information. This includes, obviously, their names, addresses and phone numbers. As well, it should keep track of insurance numbers, whether they be OHIP, Worker's Compensation or a private insurer. In some cases, it may want to indicate to the program whether these are patients seen as part of a hospital or teaching practice or as one's own private practice. Ideally, your secretary should have to enter this information only once, when a patient is seen for the first time.

Next, your system should use this information, along with information entered during a patient visit, to create a bill. As it goes along, the program should keep track as bills are sent out and later paid.

Mediputer does all this and more. It's actually a database program but its internal workings won't concern you. It costs nineteen hundred dollars for a single user version or twenty-four hundred dollars for a multiuser system, which accommodates up to seven doctors. Remember, though, this is software, not a complete computer system.

For your convenience, the manual is arranged in the order that you would use the commands on a typical day. Thus, it first discusses setting up a patient file and how to add such items as diagnoses and fees. From here it advances to how to print out a bill and post fees or payments to appropriate



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files. Next it tells how to print out the myriad of forms necessary in running a modern medical office. Finally, it goes through the ways of submitting fee claims to various health insurance agencies. This can be done on standard bills, on agency claim cards or on floppy disks. After this, it discusses how to reconcile your claims with the remittance form that you get from each agency.

Mediputer can be configured as an autoexecuting program. Thus, as soon as your secretary turns on the computer, the program starts up. Mediputer is primarily menu driven. This means that most of the time, your secretary will see a list of all possible actions she may want to take at that stage of processing. She just enters the number beside the action and it will begin. To many of us used to command driven programs such as dBase, this may seem slow and inefficient but if several employees of varying skills and experience are using your system, menus will cut down on mistakes and confusion.

There are also what the manual calls "key driven commands." At various stages in the program, you'll see a legend across the bottom of your display showing function keys and their actions in that situation. You can use *f9* to undo an error you just made or, in another routine, to send out a pattern on your printer to set up your claim cards for printing. The escape key always moves you back to the previous command.

Sample Sessions

Let's look at the Mediputer in action and see what it does. The first thing you'll want to do with Mediputer is create patient records. Immediately you'll get a full screen display of a patient record. You can enter all data in each area. If you enter too many letters or numbers, the program will warn you. After you enter a piece of data, hit the return key and your cursor jumps to the next item. You can leave non-essential fields blank but the program won't let you omit essential information.

There are some neat features to aid your data entry. The OHIP number is checked for authenticity so it's difficult to transpose numbers. You'll be summoned by a beep if you leave out any digits. You can enter the province with a single keystroke if you've set up a province table. Thus "9" might equal British Columbia and "11" Northwest Territories. You can set your own province up as a default so all you have to do is to hit return. For the city entry, you can pre-program three cities as 1, 2 and 3. Alas, I need more city codes than provincial ones.

Unfortunately, there are a few potential pitfalls. There's no internal check for legitimacy of a date. Therefore, you can enter birthdays on February thirty-first and April thirty-first. Also there's no check of postal codes. Naturally, I don't expect the program to know if my postal code should be M1K 2K3 or M1K 2K2 but it shouldn't accept MMM 888 as it does. Neither of these omissions is fatal but they should have been caught.

A feature that's a sign of the times is space for a separate name and address if the insurance policy holder has a different name or address from the patient. This covers common-law relationships, wives who don't take their husband's surnames and separated couples. It will save your secretary having to manually prepare these billings.

The next function you'll use will be the patient visit. This program calls up data you filled in previously. This is again displayed on your screen but in a different format. Now emphasis is on your diagnosis, procedure and fee. Your secretary will probably enter these from information you give her after you see your patient.

Your secretary calls up each patient file by using the number that the program assigned to each file. However, if you forgot the number, you can give the patient's surname and the program will spit out all patients with that surname along with their first name and file number. This may be a bit of a problem with Smith's, Singh's and Lee's but otherwise it's useful.

Your display will give you what medication, up to a total of twelve, your patient's taking, a list of allergies and dates of the last immunization, complete physical and Pap smear. You'll also see the reason you may have recalled this patient. Unfortunately, this feast of information shows a cloudiness in the purpose of Mediputer. Normally, your computer will be on your receptionist's desk, not in your examining room. On the other hand, you could have your secretary print out a copy of this display ahead of time and attach it to your patient's chart. This way you'd see this information. Then, after you'd seen the patient, you could write in your diagnosis, fee and date of recall for your nurse to enter into the computer.

One of the doctors using this system told me his secretary uses this function to keep track of telephone prescription repeats.

Your first job is to enter your patient's diagnosis. You have a choice of either using free style in which you simply type a diagnosis, such as "chickenpox", or using diagnostic codes agreed upon by your medical association fee schedule. There's a subroutine in your main menu that lets you toggle between these two options. However, if you're billing OHIP on diskette or by magnetic tape, you must use the diagnostic codes. Don't worry, you'll get the hang of it after a day or so. You'll be surprised by how few individual diagnoses you make, especially if you're a specialist.

After the diagnosis is entered, you'll put in a visit code. Rather than put in "intermediate assessment" or "prenatal visit," you enter A007 or P004 respectively. Many of us already do this to save writing. As soon as you've done this, the appropriate fee will appear in the next box along with a written out explanation of the visit code. For now, forget how that fee got into your program. I'll deal with that later. At this stage you may adjust the fee to give either the OHIP fee, the OMA fee or the WCB fee. In addition, you can change the fee or eliminate it all together. You've got a lot of leeway.

After this, you can decide when you want your patient recalled. There's space to tell why you want to see him again. This will help your secretary in booking an appointment and in following up to make sure the patient remembers it. Your secretary then enters any payment and goes on to print out a bill or receipt and posts any other charges to your billing account.

You merely go through all your patients during the day entering necessary information. As you go along, each financial transaction is posted to the correct file on your hard disk. At the end of the day, your secretary will tell the program to print out a day book and you'll get a list of all patients you've seen along with all your charges and payments. At the end of the month you get a monthly statement and at year's end, a financial statement for your accountant.

Eventual Cash

It's nice to know all your billing is safely on disk and also recorded on paper but you'll never pay your bills if that as far as it goes. You've got to get paid and Mediputer takes care of this in four ways. First, you can print bills directly for your patient. These can be given directly to the patient as he leaves your office or mailed later. When he pays, this is credited to his account. I wish all my bills were handled this way.

The next billing method is a variation on what most of us are doing now. The program prints all relevant data on billing cards that go to OHIP or WCB. One problem comes about because I'm in a three doctor office. Most billing programs insist our secretary load all my cards and process them, then all of each of my partners' cards and so on. Mediputer lets you use payment cards that don't have your name and office address and pay number encoded on them. Thus your secretary can type out cards for you and your associates in any order or combination necessary. Your staff will appreciate this.

After the paying agency has finished shuffling your accounts around, you'll receive a remittance form, hopefully accompanied by a cheque. Mediputer will help your secretary go through this form, reconciling its contents with the billing information you have on disk. When she's finished she can get a print out of all outstanding debts and all paid fees are credited to the correct accounts. You have the option of resubmitting bills, billing patients for any discrepancies or forgiving any outstanding amounts.

Unfortunately, there's no mechanism to keep your secretary from forgiving accounts that have been paid and pocketing the difference. This is one level of security

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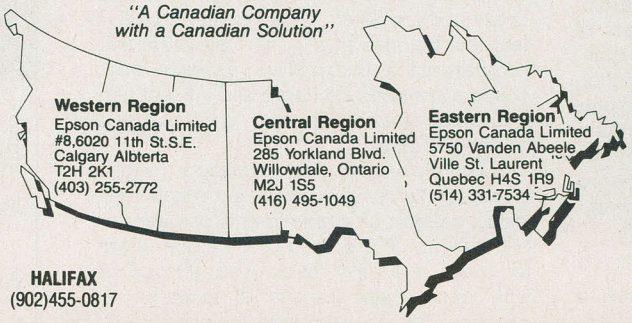

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I'd like to have seen programmed into the package. On the other hand, Craig Curphey assures me none of his clients has ever reported such a problem to him. I trust my staff but do you trust yours?

However, what's the use of having a computer if you can't process your claims electronically? Mediputer has two ways of doing this. The conventional way is to code your visits, diagnoses and fees and put them on floppy disks. Most provincial health plans have agreed to accept this format and to return your remittance form on the same medium. You then put your returned disk into your computer and turn on the reconciliation program. An hour or so later, everything is done and you have all your accounts adjusted. A printout verifies this and gives you a list of any claims not paid or only partly paid.

The time saved by this pays for your computer system many times over. Not only this, but no matter how diligent your staff is, you can expect a computer reconciliation to pick up at least a few errors that would cost you money otherwise. Have you ever noticed that all errors by your provincial health plan are in their favour?

Craig Curphey of Small Business Computing has found that three out of ten floppy disk submissions run into problems. Either OHIP can't read your disk or you can't read theirs. To get around this, he's developing a second method of electronically submitting your bills. Instead of sending in your files on floppy disks, you'll send them over the phone by modem to Small Business Computing, where data will be put on large magnetic tapes and submitted with other doctors' claims. Magnetic tapes have been used by hospitals and large clinics for years. They're much more reliable than floppy disks. Your reconciliation statement is then returned to Small Business Computing on magnetic tape and be sent back to you over your phone lines. From here you follow the same reconciliation process as for sending floppy disks.

I'm leery of mentioning a function that hasn't been implemented yet. For years, companies have promised programs that never materialized. For this reason, I wouldn't advise buying Mediputer just for the sake of transmitting your data over the phone and using magnetic tapes. There are enough other good reasons, so don't be swayed by this alone. Having said this, I'd like to point out that Small Business Computing has a reputation over six years of meeting its deadlines. In addition, the company actually programming this function has years of experience in computer telecommunications. In fact, I've used their programs for transmitting many of my articles to this magazine. I'm looking forward to seeing this method of submission working.

Back Up

Mediputer takes a no nonsense approach to backup. Rather than using fancy, and expensive, magnetic tape backups or intricate archiving software, Small Business Computing has chosen to simply back up data files onto floppy disks. The manual suggests that you do this weekly using four sets of backups. Thus it will be four weeks before you'll be overwriting the first set of floppies. This gives you enough time to discover any errors but doesn't fill your office with backup floppy disks.

After you've finished for the week, just leave the program and enter DOS where you type in BACKUP and then change disks whenever the program tells you to. This takes about two minutes per disk, each of which contains all the data for seven hundred, certainly not an onerous task. This system may leave obsessive compulsive sorts somewhat upset but I bet your manual system isn't anywhere near as protected as this system will allow you to be.

The other housekeeping function involves changing fees and procedure codes. There are specific programs to do this. They're all straight forward and lead you by the hand through the whole process.

Small Business Computing has included some interesting bells and whistles in Mediputer. I've already mentioned the first of these, the call back feature. Used properly this should increase the level of preventive medicine that we all talk about but often seem to lose track of. The second feature is the medicine record. On each patient's visit sheet there's room for twelve medications and their doses.

How often have you thought of including a medicine sheet at the front of every patient's chart? Have you ever gotten around to it? Well here it's done for you. However, as I mentioned earlier, this information will likely stay on your receptionist's desk rather than in front of you. It certainly will have a place in any future patient management program.

Similar to the medicine record is the lab report. There are two parts to this. The first is a list of fifty lab tests and their normal values. You program this in when you first get the program and you can change the normal values to those of your referring lab. At any time you can delete tests and replace them with others. This will save thumbing through your pocket reference guide to determine correct serum porcelain levels in a pregnant woman.

The second part of this feature is a list of all lab results for each patient. This is updated any time lab results come in and every entry is dated. Once again, though, I feel this belongs in a patient management program rather than a billing package. Boy, would a specialist be impressed if I sent him a printout of a the lab work on a patient I referred to him.

There's a small word processor included to let your secretary write short notes advising patients of appointments or overdue bills. It's not WordStar but it's much faster for quick and dirty tasks. Also, it's tied in with your patient address list as well as a separate list of insurance company addresses so your secretary won't have to search for an address. Better yet, she won't make any typing errors.

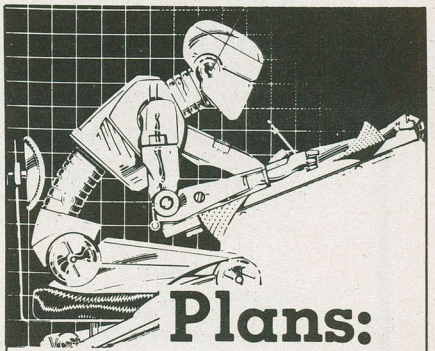
Finally, there's the doctor's book of lists. You can make lists to your heart's content. These can include a list of all the surnames in your practice or of all birthdays. This would help in keeping your paediatric practice properly immunized. Your secretary can make a list of all patients who have to be recalled for follow up visits and your book keeper can get a list of all your patients who still owe you money. The list goes on.

House Calls

You might well ask what support Small Business Computing offers. Well, for openers, they're not prepared to sell you a turnkey operation. They're not into hardware. Craig Curphey feels you can shop around and get an IBM or a compatible and printer for less than any package deal. You've also got the flexibility of buying the appropriate hardware for your practice. A bit of time and effort on your part will give you a more personal system. However, Small Business Computing is certainly prepared to advise you where they feel you'll get the best deal and to help you make the choice.

When you buy Mediputer, you get a day long training seminar for your staff. I'd be inclined to go it alone for a week and then have Craig Curphey come in and help you clear up any problems you're having. With the manual you get, I don't think you'll run into any problems with this approach. The users I spoke to all mentioned that Craig was available to help over the phone but they didn't need this very much.

You don't actually buy Mediputer, rather, you buy a licence to run it. Therefore, if your original is destroyed, just call Small Business Computing and they'll send you a new version immediately, by modem if it's practical. Also, if any bugs are detected in either your program or somebody else's, SBC will correct it for free.



Plans:

Software:	**Mediputer**
Function:	**Medical billing package**
System:	**IBM XT, AT or compatibles**
Distributor:	**Small Business Computers Ltd., 471 Darcy Street, Newmarket, Ontario L3Y 1M9 1-416-773-3475**
Price	**$1,900 single user, $2,400 multiple user**

The same applies to any improvements in the program. As long as it doesn't involve changing your data base, SBC will send you the updates for free. For instance, anyone who buys Mediputer before the telecommunications program becomes available will receive that program without charge when it's ready.

Small Business Computing has a separate accounting package that runs with Mediputer. It's not an integrated package but should be as sound as their billing program. It's available for four hundred dollars and I hope to be able to review it in the near future.

Did I find any bugs or problems in this program? Yes, but not major ones. All the bugs I found were in printing functions. They shouldn't affect the billing or accounting portion. If you try to print to the printer before it's turned on or if you run out of paper in the printer, your program will crash and return you to DOS. This isn't the end of the world because most programs won't let you print anything until you have it saved on disk. However, it could be disconcerting to a computer novice.

I did mention earlier that I didn't like integration of clinical and billing functions. By this I mean inclusion of medication and lab report records. However, these functions fit into the bells and whistles category so I wouldn't downgrade Mediputer because of them.

Who should buy Mediputer? Well, it's not for a computerphobe. It's not a turnkey package. On the other hand, I think any regular reader of Computing Now! would have no problems in setting up this system. You've got the option of picking your own hardware configuration. If you don't want a real IBM you can buy a clone. If you want to use a tape streamer backup, go ahead. If you want a colour monitor rather than a monochrome the software will certainly accommodate one.

Similarly, you can pick your own software. Too often, integrated packages have one super feature and a number of dogs. With Mediputer you can pick a heavy duty word processor like Samma or the one your kid wrote over the weekend. You can use any standard accounting package or you can even try to integrate a spreadsheet into the system. I'm told you can even run Mediputer on a Texas Instruments' Professional computer if you get tired of the "other package".

How would I use Mediputer if I were setting it up? Well, first I'd use two PC compatible computers with a half megabyte of RAM each and a ten megabyte hard disk drive. The first would go at my receptionist's desk and the second would be in the book keeping area. For the price of a similarly equipped IBM XT and a service contract for a year, I'd have a complete backup that could be switched over in minutes if one system went down. However, the backup could be used for word processing and accounting as it waited in the wings for the star to roll over dead. I'd probably get an external hard disk drive to backup data files rather than using floppies. It's faster and would give me yet more redundancy for hardware backup.

Mediputer would support this just as it does floppy backup.

Finally, I'd go with a heavy duty Centronics printer rather than the Epson that Small Business Computing recommends.

In summary, Mediputer is a work horse program to handle your billing. It has everything that you need as well as the mandatory bells and whistles. I felt some of the extra functions were clever but unnecessary. On the other hand I felt having four methods of handling your billing submissions covers all angles and gives you a lot of flexibility. If you're not afraid to save some money by doing some leg work, you'll find Mediputer a very useful addition to your practice. **CN!**

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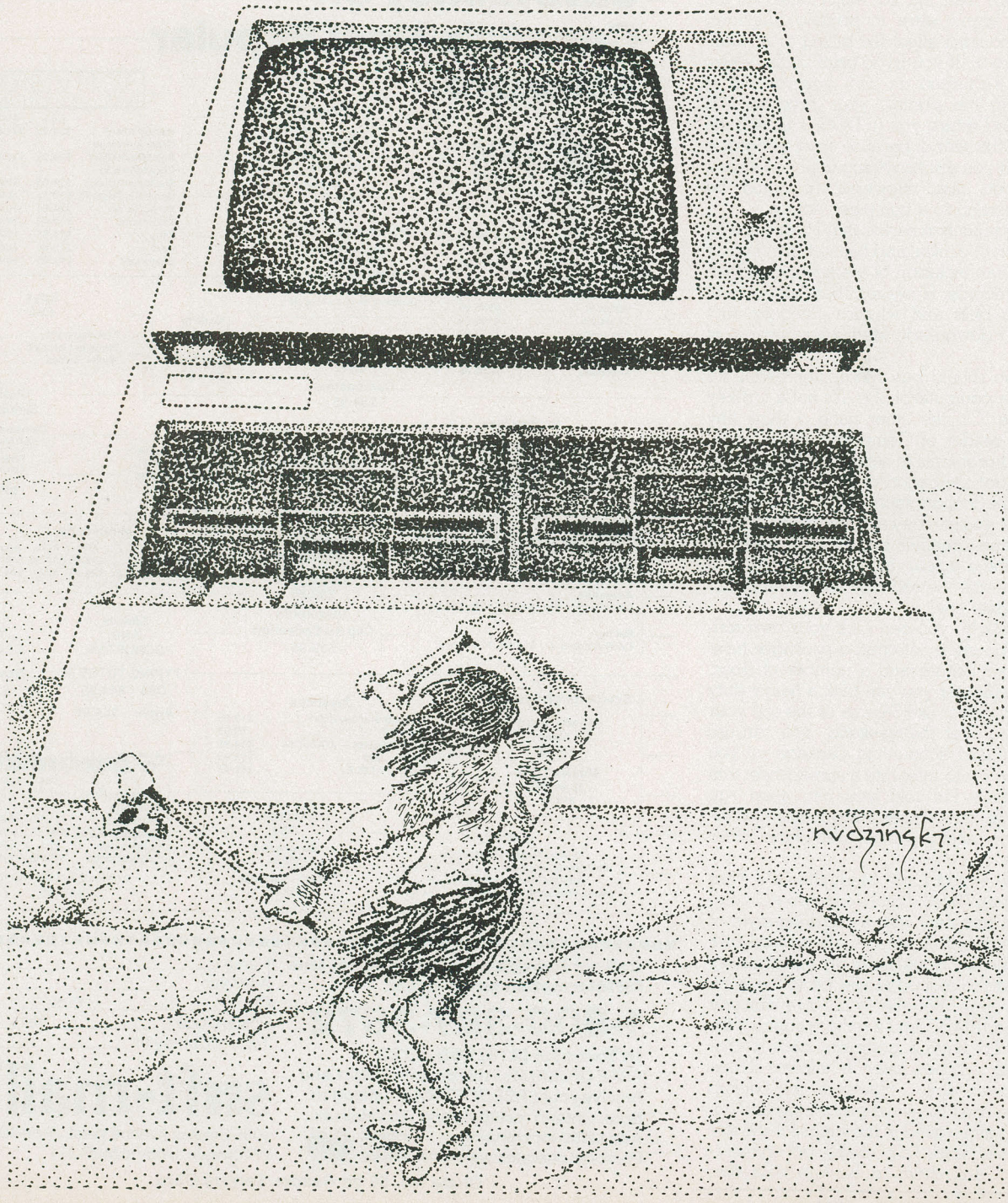
Dust In The Wind: Eight Bit Business Systems

Just because you can get state of the art computers doesn't necessarily mean that you should. There are a lot of applications for which an older system running CP/M can be just as good... or even better... than a PC running MS-DOS. Here's a look at what these machines can do.

by Steve Rimmer



Buying a business system is arguably one of the really great traumas of one's existence. I don't think that it's really the thought of popping five or ten grand for a box the size of a video recorder that does in most people, so much as it is the incredible unknowns that are lurking, like evil one eyed sludge dwarfs, within.

It's not really all that difficult to buy one's self a complete turkey, a perfectly good system that just isn't up to what one is planning to do with it. Admittedly, with all the rabid clone freaks and imports from the mysterious East lurking about it also isn't all that hard to buy genuinely odious hardware. Being able to marry one's intentions and some appropriate equipment isn't a trivial task... and certainly one that shouldn't be left to a lifeform so primitive as a computer saleman.

Part of the process of selecting a computer is in making it cost effective. If you have unlimited funds you can just go out and buy the most powerful computer on the planet and it'll probably get you by. However, most of us aren't cursed with bottomless gold cards and, as such, we're usually after the least expensive system that'll do the deed.

If you've been following the computer industry over the past few years you'll probably have noticed that the computers that used to be really tight and powerful... the eight bit systems... have been largely superceded by the newer machines, the sixteen bit PC compatibles and the still newer thirty-two bit 68000 based boxes. You might also have noticed that the prices of once expensive eight bit systems have been approaching the point where they'll be giving them away in cereal boxes.

One might well ponder the question of whether one really needs a brand new thirty-two bit number basher when there are lots of older style systems about for a quarter of the price. These archeologists' delights are not hard to find, still well supported and, for a few years anyway, were quite capable of carrying on business functions extremely well at the very leading edge of technology.

If your business hasn't gotten eight bits wider in the past few years perhaps they still can.

In this feature we're going to look at the potentials for eight bit computers... and what you can do with your little treasure once you've dragged it back to the shack.

Point of Know Return

Let's start all this with just a few technical bits. It's important to understand the differences between the older systems and the ones they've been replaced by to be able to make an intelligent decision between the two.

Most of the business computers of three or four years ago were based on what the bald guys in the lab coats called *eight bit microprocessors*. The ones we're going to talk about ran with 8080s, the precursors to the 8088, 8086 and 80286 that run the current PCs, and, more commonly, with Z80s, an enhanced version of the 8080. This smattering of numerology is only important because it means that all of these computers ran essentially the same operating system, CP/M.

CP/M is analogous to MS-DOS, except that it's not quite as slick. However, once one has CP/M running on one's computer one can run any software which is designed to run on any CP/M computer... well, this is certainly true for business oriented applications. This does not, however, mean that the disks from one CP/M based computer will run with any other system. Unlike as in the case of differing brands of PC compatibles, the disk formats of most of the eight bit systems are mutually antagonistic. There are a few exceptions, which we'll talk about in a moment.

When one buys an eight bit system the CP/M invariably comes with it. Also unlike the PC compatibles, the CP/M for one brand of eight bit computer absolutely will

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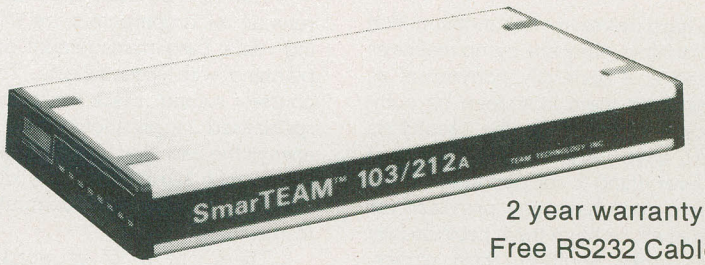

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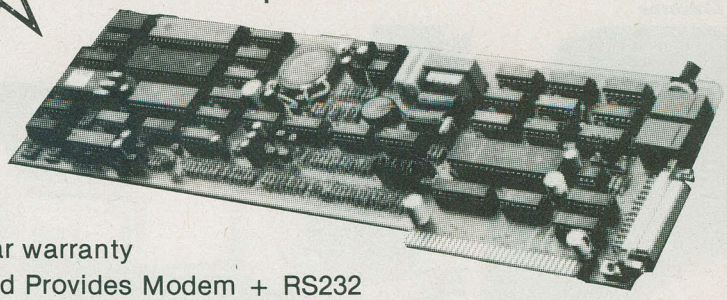

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not boot a different machine.

There are actually three unique revisions of CP/M for eight bit computers. The first, and almost totally forgotten, was CP/M 1.4. I don't think there were ever any business systems built using it. It was superceded by CP/M 2.2, which is what almost all the computers used. CP/M three, or CP/M Plus, was an attempt to create a sort of super operating system for eight bit machines, but it never really flew because by the time they got all the bugs out of it the sixteen bit computers were already chasing it up the nearest tree.

Eight bit computers are generally limited to having sixty-four kilobytes of memory. There were systems which worked in more than this by being tricky but, as one has to have specially written software to be able to access it... and few if any business packages one encounters have provisions to support this extra RAM... it's not really useful for productive applications. An eight bit computer with a quarter megabyte of memory is really an eight bit computer with sixty-four K and an unusually warm power supply.

While hard drives are not uncommon in eight bit machines, they are by no means as standardized and generally convenient as one comes upon them in sixteen bit computers. Some systems, like the ubiquitous Xerox 820, have very nicely set up hard disks and everything to support them. Quite a few others don't have any provision for fixed disks at all, or have them provided by moderately funky Southern third parties. What all this amounts to is that one can't always buy an older style system and plan to add a hard disk later on.

Very few of the eight bit business systems support any sort of graphics. Some, like the *if* 800, have really superb graphics. The Kaypro II has a graphics add on. However, what is important is that none of the graphics arrangements are the least bit standard, and there has never been enough of a potential user base available for graphics software to warrant the writing of anything particularly good. Things like computer aided design and business graphics on a realistic scale just aren't in the cards for CP/M based systems.

Wayward Sun

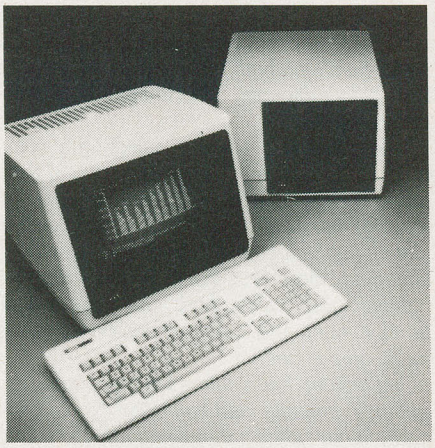
One of the primary considerations in buying a dinosaur... excuse me, a well burned in eight bit system... is getting a handle on what one of these things can really do, especially in comparison to a newer machine. Unless one is particularly hot to have the state of the art on one's desk, it's not hard to be philosophical about it and consider the computer as a black box with a function. If it performs the function adequately it really doesn't matter what sort of processor it uses to do it.

Some observers of microcomputer technology maintain that sixteen bit microprocessors are overkill. Most people don't know what to do with four bits.

The usual business applications that one runs on microcomputers are word processing, data base management and financial planning with spreadsheets. There are, of course, rotund black cast iron pots of specialized applications, but it's almost always the case that these things are written for specific hardware... one doesn't get a choice as to what sort of computer one buys to run them.

There are a lot of word processors around, and, to be sure, the PC based packages outnumber the CP/M systems by about ten to one. The one which both systems have in common, of course, is WordStar. There are those who despise this software anomaly with magnificent, seething passion, but I've yet to find anything which even begins to match its power, flexibility and human engineering. To be sure, you'll have to put in fifty hours using WordStar before most of these laudable attributes begin to make themselves apparent.

WordStar runs extremely well on the IBM PC *AT*, remarkably on many CP/M systems... and abysmally in the middle, on the lower priced IBM PC and XT machines, where it is tediously slow and very unpleasant. The system I used to write this article on, a JLS CP/M machine, is unquestionably the nicest thing imaginable to use WordStar on, far superior to any of the sixteen bit systems.



A Xerox computer

WordStar is a program which isn't really interested in having a lot of memory... and lots of memory is one of the principal attributes of the sixteen bit computers. What it does want is a really fast way of updating its video display... one of the principal failings of the sixteen bit computers. If you want to use a computer to process words an eight bit system may actually be a better choice than one of the newer boxes.

Data base managers, such as dBase II, are also not really interested in having great rippling seas of memory. They want fast processors and lots and lots of disk space if you expect to be handling a lot of information. Specifically, you'll probably want a hard disk. The dBase II package is another of those which is available for both eight and sixteen bit computers, and, in running equivalent applications on both implementations of it one finds that the choice of processor is largely irrelevant. However, as I mentioned before, hard disks aren't really practical on a lot of eight bit machines.

Spreadsheet packages are one area in which the newer sixteen bit beasts clearly excel. There are unquestionably good spreadsheet packages for the CP/M based computers, such as SuperCalc, but these things are painfully hampered by the sixty-four K upper limit on memory. If you expect to do a lot of financial modeling and like to finesse all the details down to the last quarter of a cent you'll probably run an

The Osborne

eight bit computer out to the limits fairly quickly.

The spreadsheets that are available for the PC compatibles, such as Lotus, Symphony and Multiplan, can run rings around SuperCalc under CP/M.

Some of the specialized applications that one encounters are written in Microsoft BASIC... it's worth noting that excellent implementations of this language exist for CP/M based systems as well as for those running MS-DOS. However, a lot of the screen control and other fancy bits that GW-BASIC programmers take for granted don't exist under CP/M, so these programs often take a bit of modification to run under CP/M.

As a final note, there are a lot of programs which run under both MS-DOS and CP/M, such as WordStar and dBase II. If all this is really new to you, you might want to know that while these packages act the same on their respective systems they are all different inside, and, for example, WordStar taken from a CP/M based computer to an IBM PC will hang. The WordStar that IBM users type into was rewritten from scratch to run on that computer.

Miracles Out of Nowhere

There are a lot of really cheap eight bit computers out there... and most of the time one comes across these things without really knowing much about them. To tidy things up a bit, let's take a look at some of the machines... and the gremlins which lurk within their cases.

One of the machines that crops up a lot going really cheap used is the TRS-80 Model II. Now, there's a lot to explain about this thing because it has been around almost forever and has gone through a lot of changes.

To begin with, the Model II was never designed to run CP/M, but, rather, came with TRSDOS, its own proprietary operating system. Not only is software hard to get for TRSDOS, but the operating system itself is a bit of a dog. As such, several third party suppliers created implementations of CP/M for the Model II, including something called Pickles and Trout and Lifeboat, the large New York software house.

Very recently Radio Shack began selling an implementation of CP/M Plus for the Model II which isn't really bad, but isn't as useful as some of the earlier third party efforts.

The catch with the third party versions of CP/M is that if you start having trouble with them in many cases Radio Shack will tell you that the problem is in the CP/M and the CP/M supplier will tell you that it's your hardware. Part of the time they're both right... there are at least half a dozen variations of Model IIs, each with its own compatibility hassles.

If you decide to pop for an old Model II, make sure it'll run the CP/M you want to use... or that it comes with one that works... early on. Specifically, make sure that you can use all the drives under CP/M. Many of the hassles with the Model IIs is that the operating system refuses to acknowledge the existence of drives B through D.

The Model II can support a hard disk, but it's fairly expensive. It runs with one eight inch disk in the computer and the option of up to three more in an external expansion box. Lifting either the computer or the expansion box alone will probably kill you unless you are a lineal desendant of Conan the Barbarian.

The if 800

The going price for used Model IIs is about a grand for the computer and an expansion box with one or more drives in it. However, I've seen slightly funky IIs for as little as a hundred and fifty bucks. The system is still maintained by Radio Shack's computer centre, although if you take one in for service you'll probably find they'd rather you hadn't.

Looking a bit like a bleached out version of the Radio Shack Model II but costing rather more, the Xerox 820 used to be the computer of the gods. Now it's the computer of plebs... how the mighty fall. However, the 820 was a well built computer in its day. It runs with two eight inch floppies in an expansion box and can support a hard drive.

A used Xerox 820 is a really good deal with one catch, this being the curse of the Xeroids. The Xeroids are the inhabitants of the Xerox service centres who service these things. By one account, the Xeroids don't actually fix 820s... they just change the boards in them. This gets them up and out very fast... but it costs. One user of an 820 found himself peering at a sixteen hundred dollar bill for a motherboard swap... plus labour.

On the other hand, Xerox 820s are so well built that they don't freak all that often... far less often than a Model II, for example. You might want to take your chances.

Xerox 820s often appear in clumps, as they were frequently bought in large quantities to install dedicated software back when they were state of the art. One such clump which should be available by the time this magazine hits the stands lives at Small Business Computing. Their phone number is 1-416-773-DISK.

A basic 820 usually goes for about a grand and, as I recall, these things came bundled with WordStar and several other business packages.

Moving on down the list one frequently encounters the mysterious *if* 800 system. These have cropped up used for as little as five hundred dollars of late, with seven fifty being fairly common. This is extremely attractive for a machine whose initial price when it was new rested around seven or eight grand.

The *if* 800 is a really weird looking box. It has a built in colour monitor, two high density five and a quarter inch drives and an internal dot matrix printer. The keyboard is huge, with myriads of special purpose keys and the operating system and software which come with it are all designed to support them. It also has an internal eight hundred character Japanese character set.

The system generally came bundled with CP/M and a second operating system of its own that supported a custom version of Microsoft BASIC to drive the graphics. There was also WordStar and several other applications.

The only catch involved in the *if* 800... and probably the cause of its unusually low price... is that it is extremely badly supported. In fact, according to many *if* 800 owners, "extremely badly" should read "not at all". Several importers of the system have vanished in the night, so that it's really hard to know at any one time who the current *if* distributors is... if one exists at all.

The *if* doesn't make a really slick system for many business applications in any case. Its colour screen is both moderately slow and very hard to watch for long periods of time. There is rumoured to be a small hard drive that replaces one of the system's floppies, but without a dealer to install and support it, it may remain a rumour.

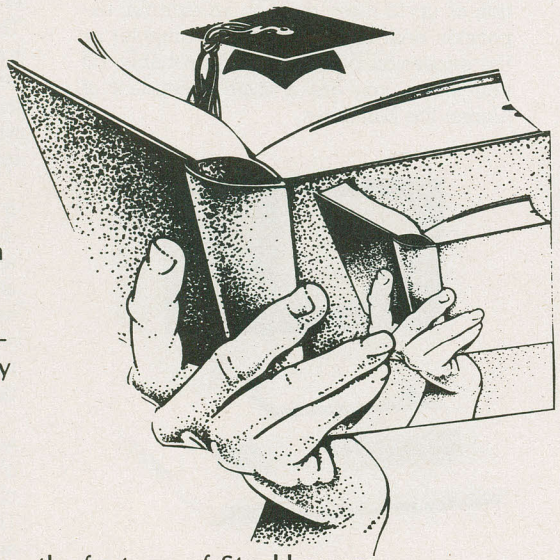
The *if* 800 embodies one of the problems with five and a quarter inch drives under CP/M. Virtually all eight inch drive machines, like the Radio Shack Model II and the Xerox 820, can write to an eight inch single sided single density format which is common to all eight inch computers. As such, getting software onto one isn't all that hard.

The *if* 800, and many other machines using five and a quarter inch drives, have their own unique disk drive formats, and can neither read nor write anything else. As such, getting software onto an *if* 800 can be a bit tricky unless you know a hacker with a modem and a lot of time.

The JLS CP/M system which I alluded to a while ago is still available new as the SBC-80. Aside from being Canadian made

$tockboy*

the lowest cost, flexible inventory control program for the IBM PC, Apple II+ (with Z80 card) and CP/M



If you're involved with managing stock, handling inventories or just counting the tins of beans you have on your shelves you're probably already aware of how much a computer could help. However, commercial inventory control packages are expensive and inflexible. They usually only run on very large, costly computers. You'll need a three year course in astrophysics to learn how to use one.

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Among the features of Stockboy are:

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The package includes a complete set of readable source files. While Stockboy can be run as it is for most applications, having the source allows you to change it if your situation is a bit unusual. A complete discussion of the package appeared in Computing Now! magazine... the back issues are available.

Stockboy is the most cost effective inventory manager there is. What's more, we can provide it for systems running PC-DOS, MS-DOS, and virtually all CP/M formats, including eight inch SSSD and Apple CP/M. The cost is only:

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A complete set of the back issues of Computing Now! that discussed the Stockboy software in detail is available for $14.95.

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and very well supported, it's easily the best CP/M based system on the planet. It's not ruinously expensive either, and it's available in a number of configurations. It hails from Micro/Access, Box 137, Station V, Toronto, Ontario, M6R 3A4.

Quite a number of portable CP/M based computers have been spawned at one time or another. The Osborne is the most commonly found of these. Like the Model II, the Osborne went through a lot of changes. The earliest Osbornes had fifty-two column screens and the absolute worst disk drive arrangement in creation. Not surprisingly, these can be had really cheaply and, also not surprisingly, shouldn't be. Later versions went to an eighty column screen and double density drives which improved their outlooks.

The Osborne company in the States seems to dance in and out of chapter eleven a lot, but, fortunately, Osborne computers are well supported in Canada by Lanpar. As such, service isn't anything to sweat over, nor is it ruinously expensive. Because they used to be quite popular, getting software in the Osborne disk format isn't too hard.

The Kaypro systems emerged as a kind of second banana Osborne, but they've both outlived and out-techo'd it. Kaypro machines are really very good computers. There's lots of support for them, the software is easy to get and they feature no severe catches at all. Because of all this, they're fairly expensive as old computers go.

The last box on my list of portables is the orphaned Zorba, a really nice machine whose parent company floated to the surface one day and rejoined the food chain. Zorbas are basically very good computers... I've lugged one across the Atlantic and on several lesser trips in the back of a '75 Chevy pickup with long deceased shocks... all without it ever coughing even once. The Zorba is interesting in that it will read something like thirty different disk formats, making it compatible with the software for almost every other computer in existence.

The only drag with Zorbas is that, so far as I can tell, there is nobody who'll fix them.

As a final note, many computer heads will point out that the Apple][+ can run CP/M with the addition of a suitable card and, as such, should be included in this list. Actually, Apples and their clones are an article unto themselves. Suffice it to say that by the time you get one sufficiently stuffed so as to make it happy with CP/M and most business software it is neither particularly cheap or particularly easy to handle. CP/M on the Apple can get a bit funky and, when all the dust has settled, these lash ups don't really make particularly good CP/M business computers.

I've noticed quite a number of really cheap no name CP/M systems being dumped. There was a system on one of the pay television channels which was being advertised for less than five hundred dollars American brand new, complete with CP/M and a raft of software. Bear in mind that a business computer absolutely has to have someone around who can fix it. An unsupported system is worse than useless... it's very easy to get your business revolving around one only to find that it's snuffed the biscuit and there's no way of reviving it.

Many of these one off machines are all but unrepairable, and well worth being paranoid about.

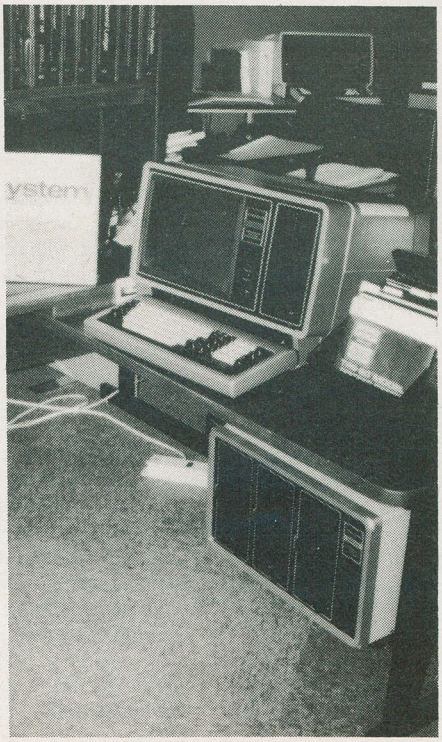
The Kaypro.

Magnum Opus

There are, of course, many systems I haven't mentioned here... although these are the ones that turn up a lot. If you're confronted with something that isn't on the list, check out the potential problems with getting it supported *before* you unfurl your wallet.

The computer stores love to flog the state of the art and in some applications it is the right direction. However, in many others you can wind up paying a lot for a system that you don't need when there are much less expensive computers around that'll do everything you want to get done.

The muse of old computers and old pickup trucks offers us the well worn credo and bumper sticker... "Don't laugh. It's paid for." **CN!**



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Circle No. 21 on Reader Service Card

The Brother Twinriter Review

If you can't decide between a dot matrix and a daisywheel printer... or you stubbornly insist on having both... you'll want to check out this printer, which has both printheads in one box.

by S.R. Ferrybridge

First impressions being so important and all, I still associate Brother with those tiny portable dot matrix typewriters they did a few years ago. They were unutterably ghastly, with tiny keyboards and ribbon cartridges that died seemingly at the end of every page.

It is, as such, peculiar to see a Brother printer as large... and as eminently useable... as is the Brother Twinriter. Ignoring their obvious rash of rampant illiteracy when they named it, the lads that designed the Twinriter put some really splendid hardware and one overwhelmingly brilliant feature into their off white plastic box.

While one eventually finds many things of note in the Twinriter, there is one aspect of it which blows away all the others. Unlike as in the case of all other printers, which are essentially either dot matrix or daisywheel the Brother is genuinely capable of handling both functions. Its print head assembly carries both a dot matrix printhead and a full size daisywheel.

The Brother is, to be sure, the ideal printer for people who need both functions and don't have the cash or the desk space to adopt two dedicated printers.

Hermaphrodites

There isn't anything really unique about the Twinriter once one gets around its rather schizophrenic outlook on life. One can most easily regard it as being a single box and platten, a single interface to the outside world and two completely separate printers. However, the obvious utility of such an arrangement will not go unnoticed by most users of one or the other sort of traditional printer.

The switches do allow for almost any circumstance the printer might find itself in when it first greets the outside world. There is a switch which allows the hardware to compensate for the varying character positions of a host of international print wheels. One can disable the beeper that audibly signals a number of things about the machine if one prefers the silence. One can configure the printer for a variety of page sizes. If one gets the printer with its optional serial interface one can, of course, also change the communications parameters.

In addition to the configuration switches there are the usual front panel switches in the usual place on the printer. The only moderately unique one of these is the mode

switch, which allows you to set up the printer to render type in either dot matrix or daisywheel characters.

There are rather more specifications to the Brother than is the case with most printers... in that there are two of them in there. The daisywheel is a ninety-six petal wheel, which is pretty standard... there are a lot of them around. It can clip along at up to thirty-six characters a second, which makes it a pretty fast letter quality printer in its own right. Its text is extremely crisp.

The dot matrix side of the tale is a nine pin head which can print as many as two hundred and three characters across a page at up to a hundred and forty characters a second in its draft mode... none too shabby either. There is also a near letter quality mode which does a hundred and thirty-six characters to a line at seventeen characters a second.

The dot matrix element is also capable of handling graphics, which we'll talk about in a minute. The printer itself has a three kilobyte buffer, which can be expanded to up to nineteen kilobytes for longer documents.

The basic Brother takes cut sheet paper one sheet at a time. However, it's worth pointing out that the whole paper feed mechanism of the thing is far more intelligently designed than is the case on most printers, as one can simply wind sheets of paper into the printer without having to jiggle an assortment of paper guides to get it to clear the head, line up properly and so on. As such, there is a cut sheet feeder available for the thing which allows one to have it print on cut sheets as if they were continuous form paper.

A tractor feed adapter is, of course, also available for the system, allowing the use of pin feed paper.

Two Heads are Better...

Both the print heads of the Brother are fairly versatile, and the controller for the whole circus allows one to handle a wide variety of driving software. The daisywheel will print in its normal mode, a double struck mode and a boldface mode, all controlled by escape sequences. Alternately, if you have software which handles this sort of thing... like WordStar... the printer can behave like simple dumb teletype, letting the software handle double striking and other effects.

Like most contemporary dot matrix printers, the dot matrix print head of the Brother is capable of dozens of different modes and variations. Also like many of the latest generation of printers, it accepts the Epson control character sequences to pop it in and out of its various modes. Unlike quite a number of popular printers which purport to be Epson compatible, however, the Twinriter actually is. There does not appear to be any Epson type control sequence which one can throw at it and have it misinterpret. Even the quad density graphics mode of the Brother responds identically to that of the Epson printers.

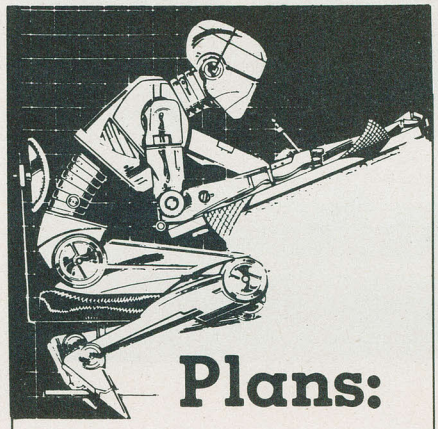
This, of course, means that virtually any application package designed to drive the popular Epson printers will run splendidly with the Twinriter. This includes quite a galaxy of word processors, spreadsheets, graphics packages and special purpose programs. As it happens, it also means that the Brother can reproduce the IBM PC's graphics characters, making it ideal for screen dumps and other PC specific uses.

A measure of how well the Brother's works have been thought out can be seen in the way it handles both of its modes. If, for example, one places it in its daisywheel mode and sends it a cloud of text containing both regular ASCII and graphics characters, it will print the ASCII with its daisywheel and the characters which the daisywheel can't reproduce with its dot matrix head... all, of course, exactingly aligned on the page.

UltraType

I think I'd place the Twinriter up on the shelf reserved for really well done peripherals. It solves a lot of problems, to be sure, but it also offers one facilities... such as its mixed modes... which are simply unavailable any other way.

The Twinriter is also well built, solid and well documented. Of course, in addition to its voluminous manual, most of the literature which pertains to Epson printers will also be applicable to it for users who want to program its trickier features.



Plans:

Printer:	**Twinriter 5, HD 35DD**
Manufacturer:	**Brother**
Type:	**Dot matrix and daisywheel**
Print Speed:	**140 draft, 36 letter quality**
Interface:	**Parallel or serial**
Suggested Reta	
Price:	**$2,737.00**
Distributor:	**SAK Data Products**

Having checked out quite a number of printers for this issue, the Brother stands out as a really splendid bit of technology, and well worth considering if you want to get characters onto paper. **CN!**

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Circle No. 1 on Reader Service Card

The DEC LA210 Printer Review

The problem with buying a printer is that there will invariably be things that it can't do. This printer seeks to solve that by emulating everything.

by S.R. Ferrybridge

There was a time... albeit no one in living memory can recall it... when printers simply printed. One sent them characters and they rendered them on paper. These simple machines were little more than electric typewriters with printer interfaces. You can still find them propping open doors and serving as pencil crocks in some of the larger offices.

Contemporary printers are, of course, rather more sophisticated. They have multifarious options, features, modes and sub-modes, they can print in multiple directions... sometimes at once... and are able to generate virtually anything on paper that a computer is capable of dreaming up.

The software that used to drive the old printers was also characteristically simple. This, like the printers themselves, has changed considerably. Contemporary software packages interact with the printers they drive to an amazing degree, allowing one to access all the features and nuances of one's printer.

This, of course, all hinges on the availability of the printer that the software designer had when he wrote the package... or packages... in question. If one's software expects to see a printer of a sort which one is sadly lacking one's printouts will generally look like topographic maps of a swamp.

The converse of this of course, is that if one has a variety of applications which call for a variety of printers one's desk will shortly look like a topographic map of a computer store.

The DEC LA210 Letterprinter is a remarkable box as printers go. Ignoring, for a moment, its relatively superb printing abilities, it possesses a unique facility to behave like virtually any printer in existence. It can do the work of a whole room full of dedicated printers with no more technical hassles than are involved in popping in and out its personality modules.

Clones I've Known

The LA210 is a rather large machine... it has a wide carriage, making it suitable for heavy printing tasks, like labels or financial reports, as well as for letters and other lesser documents. It uses a nine pin dot matrix print head which spews out some really fine print. Its maximum print speed in its draft mode is a screaming two hundred and forty characters a second.

The LA210 is hardly short of print modes. Even left to its own devices it offers one the aforementioned seven by nine dot draft mode, a thirty-three by eighteen dot letter mode, a thirty-three by nine dot almost letter mode and graphics modes with up to three hundred and thirty dots per inch horizontally. The printer is actually capable of up to almost seven hundred and fifty dots per inch, although this is rather more than most applications call for... or most users are willing to wait for... and there are internal algorythms in the printer's controller to fudge things down to lesser densities.

There are also all the emulation modes, which we'll get to in a second.

Talking to the LA210 in its pure state involves the use of a serial interface... which isn't always the most convenient mode of slinging characters at it. As such, when one buys the printer one normally also gets an external adapter box that attaches it to whatever sort of computer one owns. We got one that gave it an IBM compatible parallel port... and, thereafter, it looked just like any other printer to the computer.

The existence of the printer's serial interface, on the other hand, allows it to be used at great distances from one's computer. It can even by hung on a modem. There are numerous configuration switches that let

you set it up for unusual situations, although, as these come set up for the usual way in which printers get interfaced, one rarely has to bother with them.

The LA210 is extremely easy to operate. There's the usual contingent of buttons up top to manually feed the paper, take the printer on and off line, adjust the form characteristics and so on. There are several self test modes, one of which will have the printer blast out a statement of its current mode and emulation settings. This is quite useful, as it obviates the need to swing the thing around and check out its switches.

All Things to All People

To be sure, the LA210's printer emulation modes are among its most interesting features. There is a trap door in the top of the machine's case. Flipping this back reveals two slots which can be occupied by any of a number personality modules. If you plug in the right modules the printer will act just like a number of more commonly found machines.

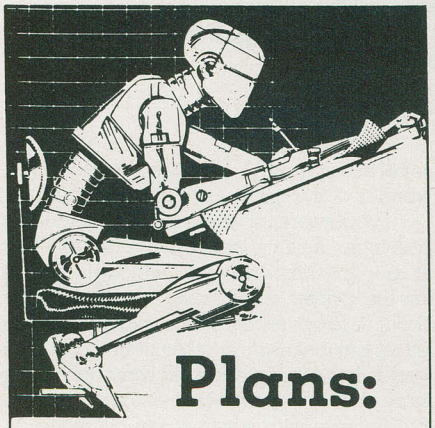
There are, for example, a number of Epson compatibility modules available for the LA210. Zap in one of these and the printer will behave just like, say, an Epson MX80 with Graftrax, down to the smallest detail.

Printer emulations traditionally have a few hassles slipped in between the cracks. Some of the older ubiquitous Gemini printers, for example, were essentially Epson compatible in their character modes but they became a little funky when they shifted into high resolution graphics. One was constantly finding inconsistancies in their version of the standard.

The LA210 has no discernible gaps in its emulation modes... it will take whatever is heaved at it and render it on paper. This includes even the dreaded quad density graphics mode, which it does without leaving any untoward gaps in its printouts. There are even variations on these modes that allow, for example, the complete IBM PC graphics character set to be installed, making PC screen dumps turn out looking right.

The high effective dot density of the LA210 makes it capable of rendering really superb type. Its letter quality modes are glorious... about as close to that of a true daisywheel as one could reasonably ask for. At the same time, its emulation modes offer one incredible convenience... and potentially fewer printers kicking around. Its incredible speed makes it a great box if you can hog it for yourself and quite suitable for sharing on a multi-user system.

If you need a powertul printer that handles absolutely everything the DEC LA210 is well worth considering. **CN!**



Plans:

Printer:	**Letterprinter LA 210**
Manufactuer:	**Digital Equipment**
Type:	**Dot matrix**
Print Speed:	**240 cps draft, 40 cps near letter quality**
Interface:	**Serial standard, parallel optional**
Suggested List Price:	**$2,410.00**
Distributor:	**Digital Equipement of Canada**

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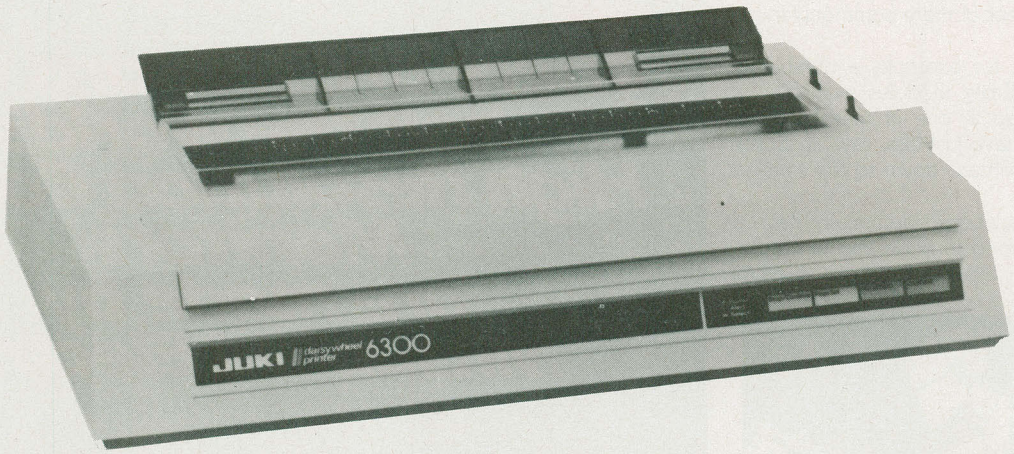
Circle No. 10 on Reader Service Card

The Juki 6300 Printer Review

Far from being yet another daisy wheel printer, this powerful machine features a number of modes, solid construction and a gigantic support organization behind it.

by S.R. Ferrybridge



There are a lot of daisywheel printers available, and one seems pretty much like another when you look at their specifications. However, there are a lot of things to be considered in choosing one.

The Juki 6300 printer is, first of all, made in the far East but it's supported by General Electric. This, in itself, is a feature of no small merit. As quite a number of printer owners have learned, the service organizations which come with one's hardware... and so often vanish in the night shortly thereafter... are easily as important as the hardware itself.

However, beyond this this Juki is a creditable printer with plenty of features and generally solid construction. It produces crisp copy with acceptable speed and interfaces to virtually anything. Finally, it comes with an exhaustive, if rather unusual, manual.

Juke Boxes

The Juki 6300 is available with either a serial or a parallel interface. As such, it will successfully hang off virtually any computer one can think of. We got a serial version, plus an optional box which allowed it to communicate with an Apple Macintosh, making it one of the few ways of getting uncomplicated letter quality printing from the Mac without springing for a LaserWriter.

The Juki is unusually easy to set up. There are configuration switches at the back of the machine for the interface, but the remainder of the switches are under the lid of the printer and easily accessible from the front. This is about the most civilized arrangement one could ask for.

The daisywheel mechanism is pretty straight up. It flips up to allow one to change wheels, which makes the whole procedure extremely painless. Likewise, the arrangement which holds the ribbon cartridge in place is clever enough to guide the ribbon into place largely by itself, allowing one to avoid the dreaded "chimney sweep's finger" which usually comes with a ribbon swap.

Despite the inherent simplicity of a daisywheel printer... you just don't have to worry about graphics modes or multiple character sizes on one of these things... there are a number of things that one can set up to one's liking on the Juki. The options are handled by the dip switches under the lid. There are two intensities of print... controlled by how hard the hammer hits the paper... various spacing parameters and several spacing settings, including... wonder of the gods... proportional spacing.

Proportional spacing used to be the sole province of very expensive printers. It is alive in the Juki, however, although the ads for the printer don't make much of a fuss about it. Proportional spacing looks funny in letters but makes most other documents look worlds better, as well as allowing one to get more stuff on a page while actually improving the ease with which it can be read.

One of the problems which many printer users encounter in daisywheel printers crops up with specialized print wheels, especially with those bearing foreign characters. Because these wheels are set up differently to accommodate the symbols needed for foreign languages, one usually has to experiment with them for a few hours to get the characters one wants to turn up in the right place.

The Juki has enough internal intelligence to compensate for these variations. There is yet another array of switches which allows one to tell the printer what sort of wheel it's holding.

The Juki comes with a three kilobyte print buffer, which is enough to hold several letters. This is handy, as it allows one to print

Juki 6300 Printer

a letter instantly and scurry on to the next one, leaving the printer to amuse itself with the actual type in the mean time. If you are primarily interested in printing large documents you can add more memory to this, creating a fifteen kilobyte buffer.

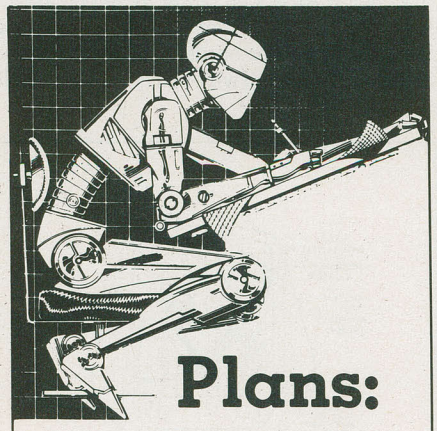
The final accessory of the Juki is its rather voluminous manual. Unlike as in the case of most operating manuals for these things, the author of this one had both a distinctive style and a sense of humour. While it isn't exactly the sort of book you'd want to curl up with, the Juki manual is eminently readable and clearly understandable, even by computerphobes.

There's also a lot of Victorian publication art worked in for reasons which aren't made completely clear. You might not have known, for example, that the first use of a roller for printing occurred in 1616 or that typists used electric dictating machines... run by storage batteries... in 1890. Heady stuff, this. It looks a lot better than the usual corporate dogma that these manuals generally contain, however.

The manual is ideally suited for souls who have made it thus far in life without becoming computer hackers. It handles the same information in multiple versions, each for one of several specific popular computers. Included in the manual are sections for the IBM PC and PCjr, The Apple, The Kaypro, The DEC Rainbow and the TRS–80. As such, one need not worry about being hung up by minor syntactical differences between one's real computer and the manual's generalized one.

The Juki, despite its rather silly name, represents a decent value in daisywheel printers. It offers pretty well anything one could ask for and all the external trappings that one always eventually needs.

It's a decided improvement over even the best 1919 Underwood typewriters. **CN!**



Plans:

Printer:	**Juki 6300**
Manufacturer:	**Juki Office Machines**
Type:	**Daisywheel**
Print Speed:	**32 cps**
Interface:	**Parallel or serial**
Suggested List Price:	**$1,600.00**
Distributor:	**Canadian General Electric**

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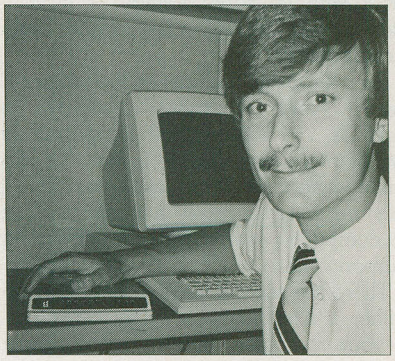

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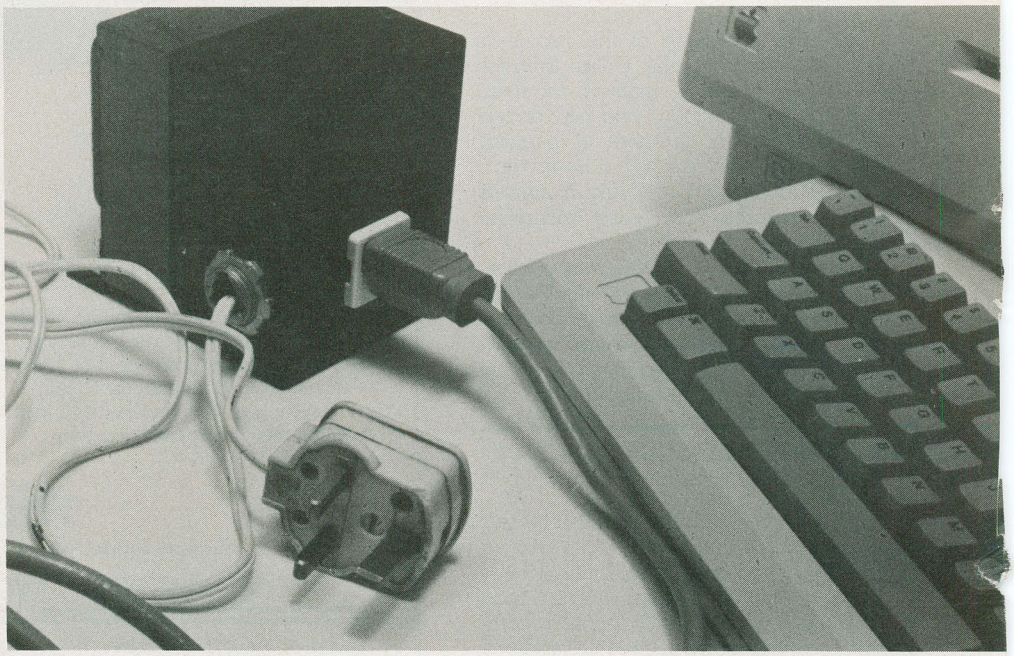
A Computer to Go

Taking your computer with you beyond the electrically safe boundaries of North America can leave you with a room full of smoke. Here's a simple box to turn hostile voltages into friendly juice.

by Steve Rimmer



Portable computers are good for short journeys... say, until you hit an ocean. Beyond these shores, however, they start getting a bit less portable because they become upset with the power conditions abroad.

Most North American systems want a strict diet of one hundred and twenty volt juice. The two hundred and twenty volt supply in the old world will blow their fuses if you're lucky... most systems will go cheerfully up in a shower of sparks at the mere thought of being plugged in over there.

There are solutions to this. Many people have tried using those little travel voltage converters that are designed to run one's electric shaver. This is a decided improvement over simply changing the plug and running with the higher voltage, as the converter usually explodes first, rather than your computer.

As it happens, the only real problem in using a North American computer in Europe is in dropping the local voltage down to more manageable levels. The difference in frequency, fifty cycles as opposed to our sixty, is rarely a hassle, in that most computer power supplies are designed to run on either.

There are several ways to get the drop together, but most require some hacking inside your computer. Here's a really simple one that can be wired in about fifteen minutes, doesn't necessitate getting inside the case at all, is easily available and is certain *not* to turn your computer into slag.

Transformations

The ideal device for changing two twenty to one ten is a transformer. However, a transformer to handle the amount of power many computers suck would be quite heavy and moderately expensive. A second shot at the problem involves the use of an *autotransformer*, which is equally as effective and quite a bit smaller and lighter.

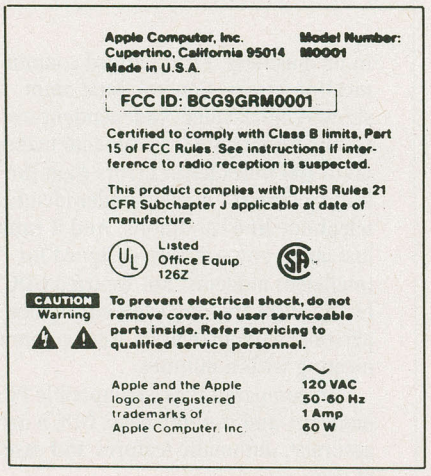
The Hammond 170 BE is specifically designed to change European power to Canadian power... or the other way around. It'll supply two hundred watts without getting overheated, which means that it'll run the average computer until long after its warrantee has expired.

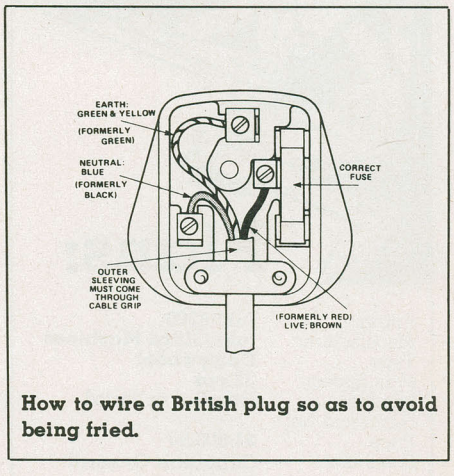
Furthermore, the 170 BE comes with all the necessary bits, including a metal plate with a North American wall plug smiling out of it. It weighs five pounds, and more or less fits in a four inch cube. It costs less than thirty dollars.

The plug that you attach to the transformer will, of course, be determined by where you're going. You may find that you have to buy it when you get there. However, foreign plugs are available at some of the larger electronics supply places over here. They're used by companies that build electronic stuff for export.

By the way, they wire plugs a bit differently across the pond. Unless you buy a plug with a cable attached to it you invariably won't have the same colour wires as they use. However, check out the diagram here to make sure that the things go to the right places in the transformer.

Another useful thing to bear in mind is that North American plugs are impossible to get over *there*. If your system needs cube taps, extra power cords or whatever make sure you bring 'em with you. **CN!**





How to wire a British plug so as to avoid being fried.

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Color Output	Yes	Optional	None	Optional
Number of Colors	512	16	None	16
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The Epson FX-85 Printer Review

One of the latest printers to emerge from Epson, the FX-85 features everything you'd ever want in a white box with a platten.

by Steve Rimmer

While perhaps not up to Rolls Royce status, the Epson printers are certainly the really expensive Oldsmobiles of the hard copy universe. That's the really decent fully restored 1971 Oldsmobile Delta 88s... not those little pseudo-Datsuns they're building now. The latest Epson, the FX-85, is a '71 Olds with a new transmission, a 455 engine and a four barrel carb. It just sings.

The Epson FX printers have always been kind of slick and state of the art. The IBM PC and its descendants are all partied out to work with these things. Most word processors can be installed to produce the codes that drive the Epsons in all their multifarious modes and, as such, it's not really surprising that the Epson control codes have become something of a standard that lesser machines try to emulate.

The FX-85 is a really decent advancement in the evolution of Epson dot matrix machines. Essentially, while it maintains pretty well total compatibility with software designed to drive its ancestors, it produces still nicer print and has just a bit more flexibility than did the older machines. If you've got the bucks it's a splendid slab of hardware.

Pins and Needles

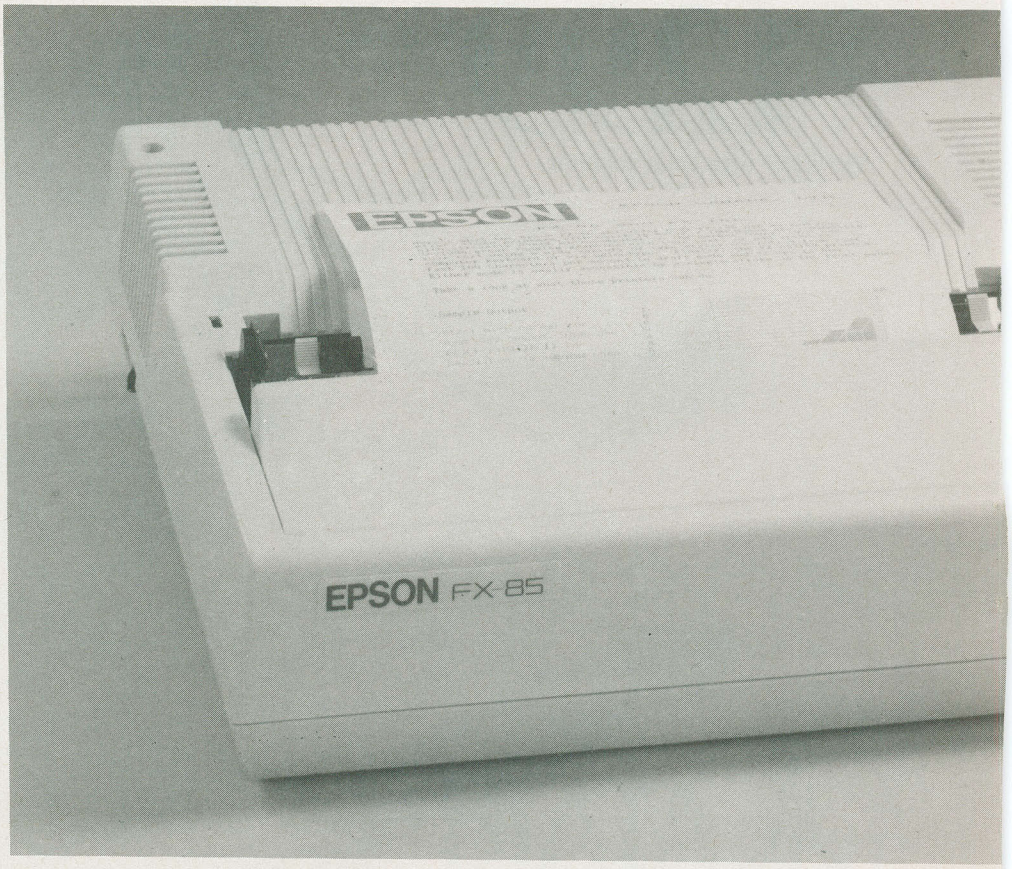
The FX-85 doesn't look a lot different than the older Epsons, although there are a number things that users of earlier printers will appreciate about it. For one thing, its DIP switches can be accessed under an easily reached cover in the top of the printer... you don't have to worm your way around behind your computer table. The control panel at the front of the machine is pretty slick too... it lets one drop the printer into any of its major print modes without escaping from anything.

Alternately, of course, all the printer's options can be controlled from software.

The FX-85 also has lots of ways of handling paper.There's an optional tractor feed and wire feet to let it sit on top of a stack of form feed paper. It will also do single sheets.

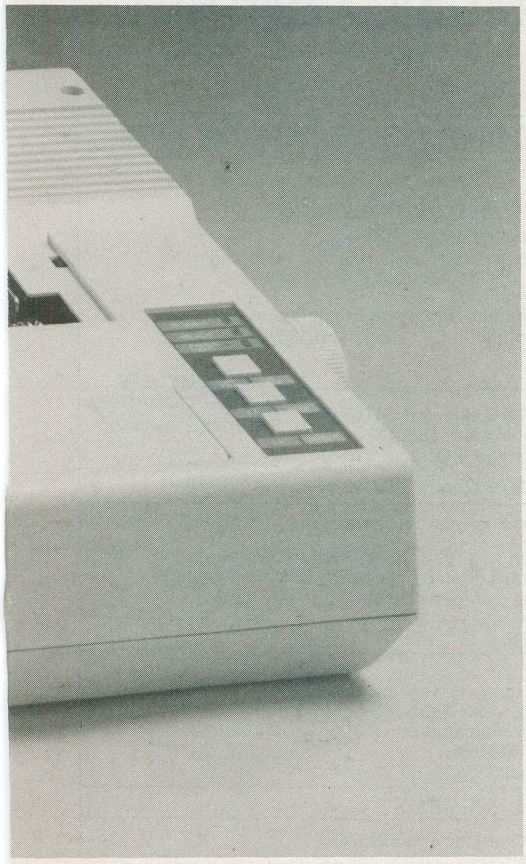
The printer has two major print modes, to wit, regular draft quality type and a near letter quality party that almost looks like it's been done by a typewriter. From this point on one can select various permutations of type.

The basic characters of the printer are formed with a nine by nine matrix of pins. However, the control the printer has over the horizontal positioning of its print head is so fine that it can overlap the dots on multi-



```
C:FX85  PAGE 1 LINE 1 COL 01                    INSERT ON
L-------!-------!-------!-------!-------!-------!-------!-------!-------!-------!-------R
This is the story of Tharg the electric Dwarf. Tharg lived in a
1979 Oldsmobile Delta Royal in the parking lot of an IBM
typewriter repair centre. He had all his friends with him,
including Waldo the five eyed mouse from the Revlon research
labs, Zap the Martian and a nameless Xeroid from the accounting
department. They all lived happily in the backseat of the
Oldsmobile laughing and talking and making great plans about what
they'd do if they were ever reincarnated as traffic control
computers.                                                      <
        One very bright and sunny day Tharg opened the door of
the Olsmobile to get up and catch the bus for work and he found,
much to his surprise, that the ground has dissapeared, only to
be replaced by a lush green carpet of Astroturf which stretched
out in all directions. At least, it looked like Astroturf, except
that it was extremely peculiar in that it didn't smell like
pastic and it was kind of cool when Tharg put his hnd on it.     <
        "Hey guys," said Tharg. "The parking lot's gone."       <
                                                                .
                                                                .
                                                                .
                                                                .
                                                                .
1HELP  2FINDPR 3SET LM 4SET RM 5UNDLIN 6BLDFCE 7BEGBLK 8ENDBLK 9BEGFIL 10ENDFIL
```

A screen dump to the FX-85



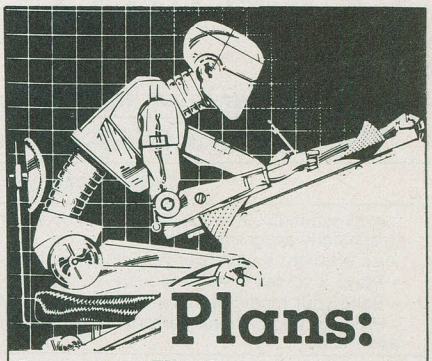
ple passes across the same line, producing the illusion of some really tight print. This is the basis of its near letter quality modes.

In the draft mode, the printer can handle up to a hundred and sixty characters per second. It prints bidirectionally and has internal logic to skip over areas of a line that don't have to be printed, thus speeding up the effective printing of a document still further.

The line spacing is programmable in increments as small as 1/216 of an inch. One can have as many as a hundred and sixty characters on a line in the FX-85's compressed mode.

As is the case with pretty well any civilized printer made in the last demi-eon, the FX-85 can do a lot of printing effects. One can have compressed and expanded type mixed in with regular print. There are also body and double strike modes, which can be combined with most of the other effects. The thing will do itallics, underlining and sub and superscripts.

One of the really superb features of the FX-85 is its ability to produce proportionally spaced print. It can handle all the micro-justification and general padding out. This not only makes one's print look a lot more attractive and readable... it also lets you put quite a bit more stuff on a page without sacrificing the readability of what you render on paper.



Plans:

Printer:	**FX–85**
Manufacturer:	**Epson**
Type:	**Dot matrix**
Modes:	**Draft, near letter quality, graphics**
Print Speed:	**Up to 160 cps**
Interface:	**Parallel standard, others optional**
Distributor:	**Epson Canada Limited**
List Price:	**$799.00**

Because the FX-85 is intended to be used with the IBM PC, there is a software selectible IBM character set in there somewhere which allows it to print most of the screen graphics characters the PC can heave onto its tube. These aren't exactly as they show up on the PC... for example, the double lines that are used for boxes turn up as single lines on the printer... but things are close enough to make one's screen dumps look pretty convincing.

Epson FX-85

There are also several international character sets to allow printing documents in foreign languages with the correct punctuation and freaky characters.

If the FX-85 just doesn't cut it with the characters it has, one can reprogram its character set with characters of one's own devising. The manual's pretty lucid about how this is done... alternately, you might want to check out the "Fontasy for the Gemini 10X" article in the June 1985 edition of Computing Now!... the codes are the same.

The final party on the FX-85 is its ability to handle dot matrix graphics. It can reproduce bit maps with incredible resolution and, if you party out in its higher density modes... and don't mind the wait... these things are a bit slow... it can generate pictures which are significantly tighter than anything one could hope for on a monitor.

The bit mapped images look good as business graphs as well as the traditional pictures of naked ladies and other pseudo-Macintosh art. I've come across several graphics packages which could use the higher density modes to generate near plotter resolution with the thing... although a typical eight and a half by eleven drawing could take about three quarters of an hour to create.

This is the story of Tharg the electric Dwarf. Tharg 1979 Oldsmobile Delta Royal in the parking lot of an typewriter repair centre. He had all his friends with including Waldo the five eyed mouse from the Revlon r labs, Zap the Martian and a nameless Xeroid from the department. They all lived happily in the backseat of Oldsmobile laughing and talking and making great plan they'd do if they were ever reincarnated as traffic c computers.

The FX-85's near letter quality mode.

Printer of the Gods

The final impressive part about the FX-85 is its price. While it certainly isn't as cheap as some of the really low budget printers that emulate it, it isn't really that much more expensive. It unquestionably produces better print and it's as rugged as a swamp troll that's fallen asleep in a cement mixer. All of the Epson compatible software that exists for a variety of areas of application will, not surprisingly, work with it.

If you can afford the extra couple of hundred bucks for one of these things you should unquestionably pop for it. It's among the best ways of converting ASCII to real words that the cosmic fiberglass overlords have ever handed down to mere mortals. A version with a wide platten, the FX-185, also exists for people who play with spreadsheets or just like extremely wide paper.

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The Printer Survey

There are enough printers to keep most potential printer owners guessing for weeks. If you're considering becoming the proud owner of one you might want to look at this roundup of everthing that's fit to print.

by CN! Staff

Admate DP-80

Manufacturer:	Admate, Vancouver, B.C.
Type:	Dot matrix
Pin Matrix:	8 x 9
Graphics:	7 x 9
Print Speed:	80 cps
Character Sizes:	3
Carriage/Paper Width:	10 inches
Interface:	Centronics parallel standard, RS-232C optional
Suggested Retail Price:	$325.00
Representatives:	T.W. Wilson Sales
Distributor(s):	SAK Data

Admate DSY-120

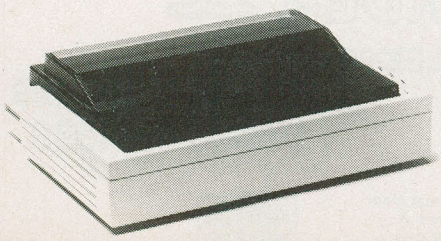
Manufacturer:	Admate
Type:	Daisy wheel
Pitch:	10, 12, 15, proportional
Print Speed:	18 cps
Carriage/Paper Width:	15 inches
Interface:	Centronics parallel or RS-232C
Suggested Retail Price:	$545.00
Representatives:	T.W. Wilson Sales
Distributor(s):	SAK Data

Advantage D25

Manufacturer:	Diablo/Xerox
Type:	Daisy wheel
Graphics:	Yes
Pitch:	10, 12, 15, proportional
Print Speed:	25 cps
Carriage/Paper Width:	15.2 inches
Interface:	Centronics and IEEE-488 parallel, RS-232C
Suggested List Price:	$995.00
Distributor:	Xerox Canada

Apple Daisy Wheel

Manufacturer:	Apple
Type:	Daisy wheel
Graphics:	Yes
Pitch:	10, 12, 15 or proportational
Print Speed:	40 cps (average)
Carriage/Paper Width:	15 inches
Interface:	RS-232C
Suggested Retail Price:	$1,695.00
Distributor(s):	Apple, authorized dealers



Atari SDM 124

Manufacturer:	Atari
Type:	Daisy wheel
Pitch:	N/A
Print Speed:	12 cps
Carriage/Paper Width:	11.8 inches
Interface:	Centronics parallel
Suggested Retail Price:	$399.95
Distributor(s):	Atari

Atari XMM 801

Manufacturer:	Atari
Type:	Dot matrix
Pin Matrix:	8 x 9
Print Speed:	N/A
Character Sizes:	3
Downloads:	Yes
Carriage/Paper Width:	11.8 inches
Interface:	Atari-specific
Suggested Retail Price:	$299.95
Distributor(s):	Atari

Axiom DX1500

Manufacturer:	Axiom, San Fernando, CA
Type:	Daisy wheel
Pitch:	10, 12
Print Speed:	14 cps
Compatibility:	Diablo
Carriage/Paper Width:	9.7 inches
Interface:	Centronics parallel
Suggested Retail Price:	$496.00
Distributor(s):	Wells Data Products

Axiom DX3500

Manufacturer:	Axiom
Type:	Daisy wheel
Pitch:	10, 12, 15, proportional
Print Speed:	35 cps
Compatibility:	Diablo
Carriage/Paper Width:	15.7 inches
Interface:	Centronics parallel and RS-232
Suggested Retail Price:	$1,170.00
Distributor(s):	Wells Data Products

Brother HR-5 Compact

Manufacturer:	Brother
Type:	Dot matrix
Pin Matrix:	9 x 9
Graphics:	Yes
Print Speed:	30 cps
Carriage/Paper Width:	8.5 inches
Interface:	Centronics parallel or RS-232C
Suggested Retail Price:	$300.00
Distributor(s):	SAK Data

Brother HR-15XL

Manufacturer:	Brother
Type:	Daisy wheel
Pitch:	10, 12, 15
Print Speed:	17 cps
Carriage/Paper Width:	8.5 inches
Interface:	Centronics parallel and RS-232C
Suggested List Price:	$849.00
Distributor:	Computech Micro Design

Brother 2024L

Manufacturer:	Brother
Type:	Dot matrix
Pin Matrix:	24 pins
Graphics:	Yes
Print Speed:	80-96 cps NLQ, 160 cps draft
Downloads:	Yes
Carriage/Paper Width:	15 inches
Interface:	Centronics parallel standard, RS-232C optional
Suggested Retail Price:	$1,975.00
Distributor(s):	SAK Data

Canon PW-1156A

Manufacturer:	Canon Canada
Type:	Dot matrix
Pin Matrix:	1 x 9 draft, 23 x 18 NLQ
Graphics:	Yes
Pitch:	Various
Print Speed:	160 cps draft, 27 cps NLQ
Downloads:	Yes
Carriage/Paper Width:	17 inches
Interface:	Centronics parallel standard, RS-232C optional
Suggested Retail Price:	$1,065.00
Distributor:	Canon Canada

Centronics 351-PC (Printstation 350 series)

Manufacturer:	Centronics
Type:	Dot matrix
Pin Matrix:	7 x 9
Graphics:	Yes
Print Speed:	200 cps draft, 65 cps LQ
Carriage/Paper Width:	N/A
Interface:	Parallel and serial
Suggested Retail Price:	$2,870.00
Distributor(s):	Wells Data Products

Citizen MSP 10/15

Manufacturer:	Citizen America Corporation
Type:	Dot matrix
Pin Matrix:	9 x 9

Printer Survey

Graphics: Yes
Pitch: Various
Print Speed: 160 cps draft, 40 cps LQ
Compatibility: Epson, IBM
Carriage/Paper Width: 10 inches (MSP 10), 16 inches (MSP15)
Interface: Parallel standard, RS-232C optional
Suggested List Price: $590.00 (MSP10), $808.00 (MSP15)
Distributor: Ahern and Soper
Dealer: Computech Micro Design

Citizen MSP 20/25

Manufacturer: Citizen America Corporation
Type: Dot matrix
Pin Matrix: 9 x 9, to 17 x 17
Graphics: Yes
Pitch: Various
Print Speed: 200 cps draft, 50 cps LQ
Downloads: Yes
Compatibility: Epson, IBM
Carriage/Paper Width: 10 inches (MSP20), 16 inches (MSP25)
Interface: 8-bit parallel standard, RS-232C optional
Suggested List Price: $726.00 (MPS20), $1,118.00 (MPS25)
Distributor: Ahern and Soper

C.Itoh CI-3500, model 20

Manufacturer: C.Itoh
Type: Dot matrix
Pin Matrix: 9 x 7 draft, 17 x 16 LQ
Graphics: Yes
Pitch: Various
Print Speed: 350 cps draft, 87 cps LQ
Downloads: Yes
Compatibility: Epson
Carriage/Paper Width: Up to 16 inches
Interface: Centronics parallel
Suggested Retail Price: $2,945.00
Distributor: C.Itoh and Co., Canada
Dealer: Norango

CI Concorde 1100

Manufacturer: Contitronix Inc., Garland, TX
Type: Daisy wheel
Graphics: Yes
Pitch: 10, 12, 15, proportional
Print Speed: Up to 45 cps
Carriage/Paper Width: 13.2 inches
Interface: Centronics parallel or RS-232
Suggested Retail Price: $1,495.00
Dealer: Computron

Commodore DPS 1101

Manufacturer: Commodore
Type: Daisy wheel
Pitch: 10, 12, 15, proportional
Print Speed: 18 cps
Carriage/Paper Width: 13 inches
Interface: Parallel
Suggested Retail Price: $599.95
Distributor: Commodore Business Machines

Commodore MPP 1361

Manufacturer: Commodore
Type: Dot matrix
Pin Matrix: 5 x 8
Print Speed: 150 cps
Downloads: Yes
Carriage/Paper Width: 14 inches
Interface: Parallel
Suggested Retail Price: $995.00
Distributor: Commodore

Companion 34 LQ

Manufacturer: Diablo/Xerox
Type: Dot matrix
Pin Matrix: 9 x 7 draft, 18 x 60 LQ
Graphics: Yes
Pitch: Various
Print Speed: 270 cps draft, 60 cps LQ
Downloads: Yes
Compatibility: Epson
Carriage/Paper Width: 15 inches
Interface: Centronics parallel or RS-232
Suggested List Price: $1,795.00
Distributor: Xerox Canada

Copal SC-1200

Manufacturer: Copal (U.S.A.) Inc.
Type: Dot matrix
Pin Matrix: 9 x 9
Graphics: Yes
Pitch: Various
Print Speed: 120 cps
Carriage/Paper Width: 10 inches
Interface: Centronics parallel standard, RS-232 optional
Suggested List Price: $600.00
Distributor: Zentronics

Daisywriter DX-10/20

Manufacturer: Epson
Type: Daisy wheel
Pitch: Various
Print Speed: 10 cps (DX-10), 20 cps (DX-20)
Compatibility: Epson
Carriage/Paper Width: 8.5 inches (DX-10), 15 inches (DX-20)
Interface: Parallel
Suggested List Price: $529.00 (DX-10), $749.00 (DX-20)
Distributor: Epson Canada

Daisy Systems M45

Manufacturer: Daisy Systems, Holland
Type: Daisy wheel
Pitch: 10, 12, 15, proportional
Print Speed: 45 cps
Carriage/Paper Width: 15 inches
Interface: Centronics parallel, or RS-232C, or IEEE-488
Suggested Retail Price: $1,899.00
Distributor: Technical Logistics Support (TLS)

Daisy Writer 2000

Manufacturer: Fujistsu America
Type: Daisy wheel
Graphics: Yes
Pitch: 10, 12, 15, 20
Print Speed: 40 cps
Compatibility: Diablo, Qume, NEC
Carriage/Paper Width: 16.5 inches
Interface: Parallel and serial
Suggested List Price: $1,799.00
Distributor: Technical Logistics Support (TLS)

Dataproducts 8010

Manufacturer: Dataproducts
Type: Dot matrix
Pin Matrix: 9 x 9 draft, 36 x 18 LQ
Graphics: Yes
Pitch: Various
Print Speed: 180 cps draft, 30 cps LQ
Downloads: Yes
Carriage/Paper Width: 8.5 inches
Interface: Parallel and RS-232C
Suggested List Price: $723.00
Distributor: Ahern and Soper

Dataproducts 8072

Manufacturer: Dataproducts
Type: Dot matrix
Pin Matrix: 18 x 9 draft, 36 x 18 LQ
Graphics: Yes
Pitch: Various
Print Speed: 400 cps draft, 100 cps LQ
Downloads: Yes
Carriage/Paper Width: 13.2 inches
Interface: Centronics parallel
Suggested Retail Price: $3,295.00
Distributor: Printerm

Datasouth DS 220

Manufacturer: Datasouth Computer Corporation
Type: Dot matrix
Pin Matrix: 9 x 7 draft, 18 x 48 NLQ
Graphics: Yes
Pitch: Various
Print Speed: 220 cps draft, 40 cps NLQ
Downloads: Yes
Compatibility: Epson, IBM
Carriage/Paper Width: 15 inches
Interface: Centronics parallel and RS-232C
Suggested List Price: $2,618.00
Distributor: Datamex

Diablo 32CQI series

Manufacturer: Diablo/Xerox
Type: Dot matrix
Pin Matrix: 9 x 11 draft, 16 x 36 NLQ
Graphics: Yes
Pitch: Various
Print Speed: 150 cps draft, 60 cps NLQ
Downloads: Yes
Carriage/Paper Width: 15 inches
Interface: Centronics parallel
Suggested List Price: $1,195.00
Distributor: Xerox Canada

Epson FX-85/185

Manufacturer: Epson
Type: Dot matrix
Pin Matrix: 9 x 9
Graphics: Yes
Pitch: Various
Print Speed: Up to 160 cps
Downloads: Yes
Carriage/Paper Width: 8.5 inches (FX-85), 12 inches (FX-185)
Interface: Parallel
Suggested List Price: $799.00 (FX-58), $1,199.00 (FX-185)
Distributor: Epson Canada

Epson JX-80 Color

Manufacturer: Epson
Type: Dot matrix
Pin Matrix: 9 x 9
Graphics: Yes
Pitch: Various
Print Speed: Up to 160 cps
Downloads: Yes
Carriage/Paper Width: 8.5 inches
Interface: Parallel
Suggested List Price: $1,095.00
Distributor: Epson Canada

Facit 4528

Manufacturer: Facit
Type: Dot matrix
Pin Matrix: 9 x 9
Graphics: Yes
Pitch: Various
Print Speed: Up to 285 cps
Downloads: Yes
Carriage/Paper Width: 15 inches
Interface: Centronics parallel and RS-232C
Suggested List Price: $1,935.00
Distributor: Lanpar Technologies

Facit 4565

Manufacturer: Facit
Type: Daisy wheel
Pitch: 10, 12, proportional
Print Speed: 40 cps
Carriage/Paper Width: 16 inches
Interface: RS-232C
Suggested List Price: $2,323.00
Distributor: Lanpar Technologies

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Flick a switch and the LA210 shifts to an 18x33 matrix for crisp, near-letter quality copy at up to 40 characters per second.

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There's more, too. With its standard Courier type face, the LA210 can print 11 languages,

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plus Digital's VT100 line drawing set. And it gives you a choice of more than 35 optional faces and fonts – Courier, Orator, Gothic, APL, and italics as well as special custom fonts – through plug-in cartridges that let you vary your type face even more. Finally, the LA210 lets you print bold or condensed and change faces or fonts on a dynamic character-by-character basis. So your output is truly customized to suit just about any presentation you have in mind.

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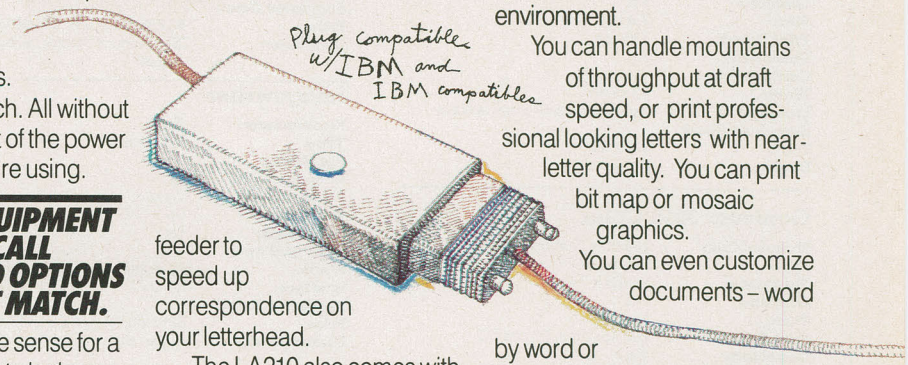

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Printer Survey

Gemini 10X

Manufacturer: Star Micronics
Type: Dot matrix
Pin Matrix: 9 x 9
Graphics: Yes
Pitch: Various
Print Speed: 120 cps
Downloads: Yes
Carriage/Paper Width: 10 inches
Interface: Parallel standard, serial optional
Suggested Retail Price: $299.00
Dealer: Exceltronix

Genicom 3310 Color

Manufacturer: Genicom Corporation
Type: Dot matrix
Pin Matrix: to 288 x 144
Graphics: Yes
Pitch: Various
Print Speed: 300 cps draft, 90 cps LQ
Downloads: Yes
Compatibility: Diablo, IBM
Carriage/Paper Width: 15.5 inches
Interface: Parallel and serial
Suggested List Price: $3,595.00
Distributor: Canadian General Electric

Great Little Printer (GLP) series

Manufacturer: Centronics
Type: Dot matrix
Pin Matrix: 9 x 9 draft, 18 x 23 NLQ
Graphics: Yes
Print Speed: 50 cps draft, 12 cps NLQ
Character Sizes: 3
Carriage/Paper Width: Up to 10 inches
Interface: Centronics parallel and RS-232
Suggested Retail Price: $375.00
Distributor(s): Centronics

Hermes PC series

Manufacturer: Hermes Products, Switzerland
Type: Dot matrix
Pin Matrix: 9 x 12
Graphics: Yes
Pitch: 10, 12
Print Speed: Up to 400 cps draft, 100 cps NLQ
Compatibility: IBM
Carriage/Paper Width: 15.5 inches
Interface: Parallel
Suggested List Price: $2,874.00 (PCP4)
Distributor: Ahern and Soper

HomeWriter 10

Manufacturer: Epson
Type: Dot matrix
Pin Matrix: N/A
Print Speed: 100 cps draft, 16 cps NLQ
Downloads: Yes
Carriage/Paper Width: 8.5 inches
Interface: Parallel
Suggested List Price: $499.00
Distributor: Epson Canada

Horizon H136

Manufacturer: Centronics
Type: Dot matrix
Pin Matrix: 11 x 9 draft, 23 x 16 NLQ
Graphics: Yes
Print Speed: 160 cps draft, 27 cps NLQ
Character Sizes: 3
Downloads: Yes
Carriage/Paper Width: Up to 17 inches
Interface: Centronics parallel standard, RS-232 optional
Suggested Retail Price: $1,145.00
Distributor(s): Wells Data Products

IBM 5218 models A03-4

Manufacturer: IBM
Type: Daisy wheel
Pitch: 10, 12, 15, proportional
Print Speed: 40-60 cps
Carriage/Paper Width: 15.4 inches
Interface: RS-232C
Suggested Retail Price: $3,686.00 (A03), $3,990.00 (A04)
Distributor: IBM Product Centres, authorized dealers

Imagewriter

Manufacturer: Apple
Type: Dot matrix
Pin Matrix: 7 x 9
Graphics: Yes
Pitch: Various
Print Speed: Up to 120 cps
Downloads: Yes
Carriage/Paper Width: 10 inches standard, 15 inches w/c
Interface: RS-232
Suggested Retail Price: $950.00, $1,100.00 wide carriage
Distributor(s): Apple, authorized dealers

Juki 5510

Manufacturer: Juki Office Machines
Type: Dot matrix
Pin Matrix: 9 x 9 draft, 21 x 27 NLQ
Graphics: Yes
Pitch: Various
Print Speed: 180 cps draft, 30 cps NLQ
Compatibility: Epson, IBM
Carriage/Paper Width: 10 inches
Interface: Parallel standard, serial optional
Suggested Retail Price: To be announced
Distributor: Canadian General Electric
Dealer: Computron

Juki 6300

Manufacturer: Juki
Type: Daisy wheel
Graphics: Yes
Pitch: 10, 12, 15, proportional
Print Speed: 32 cps
Carriage/Paper Width: 16 inches
Interface: Centronics parallel or RS-232C
Suggested List Price: $1,600.00
Distributor: Canadian General Electric
Dealer: Computron

Letterprinter LA210

Manufacturer: Digital
Type: Dot matrix
Pin Matrix: 7 x 9 draft, 33 x 18 LQ
Grpahics: Yes
Pitch: Various
Print Speed: 240 cps draft, 40 cps LQ
Compatibility: Epson, IBM
Carriage/Paper Width: 15 inches
Interface: RS-232C standard, parallel optional
Suggested List Price: $2,410.00
Distributor: Digital Equipment of Canada

LetterPro 20

Manufacturer: Qume
Type: Daisy wheel
Pitch: Various
Print Speed: 20 cps
Carriage/Paper Width: 8.5 inches
Interface: Parallel or serial
Suggested Retail Price: $960.00
Distributor: Printerm

Mannesmann Tally 85/86 (Quiet)

Manufacturer: Mannesmann Tally
Type: Dot matrix
Pin Matrix: 9 x 9 draft, 24 x 18 LQ
Graphics: Yes
Pitch: 10, 12, 17, proportional
Print Speed: 180 cps draft, 45 cps LQ
Downloads: Yes
Carriage/Paper Width: 8.5 inches (MT85), 12 inches (MT86)
Interface: parallel and serial
Suggested List Price: $749.00 (MT85), $895.00 (MT86)
Distributor: Watson Computer Products

Mannesmann Tally 490L

Manufacturer: Mannesmann Tally
Type: Dot matrix
Pin Matrix: 9 x 9 draft, 48 x 18 LQ
Graphics: Yes
Pitch: Various
Print Speed: 400 cps draft, 150 cps LQ
Downloads: Yes
Carriage/Paper Width: 15 inches
Interface: Parallel or serial
Suggested List Price: $3,595.00
Distributor: Watson Computer Products

Microline 193

Manufacturer: Okidata
Type: Dot matrix
Pin Matrix: 9 x 9 draft, 17 x 17 LQ
Graphics: Yes
Pitch: Various
Print Speed: 175 cps draft, 87 cps LQ
Downloads: Yes
Carriage/Paper Width: 15 inches
Interface: Parellel or serial
Suggested List Price: $1,075.00
Distributor: CDI Computer Distribution Inc.,

Mitak TMM1500

Manufacturer: Mitak
Type: Dot matrix
Pin Matrix: 9 x 9
Graphics: Yes
Pitch: Various
Print Speed: 130 cps
Downloads: Yes
Carriage/Paper Width: 8 inches
Interface: Parellel or serial
Suggested List Price: $399.00
Distributor: Technical Logistics Support (TLS)

Mitsui MC 4200

Manufacturer: Mitsui, for TEO
Type: Dot matrix
Pin Matrix: 9 x 9 draft, 18 x 11 NLQ
Graphics: Yes
Pitch: Various
Print Speed: Up to 180 cps
Downloads: Yes
Carriage/Paper Width: Up to 15 inches
Interface: Centronics parallel or RS-232C
Suggested Retail Price: $1,250.00
Distributor: TEO Computers and Peripherals

Okimate 20 Color

Manufacturer: Okidata
Type: Dot matrix
Pin Matrix: 7 x 18 draft, 14 x 18 LQ
Graphics: Yes
Pitch: Various
Print Speed: 80 cps draft, 40 cps LQ
Downloads: Yes
Carriage/Paper Width: 10 inches
Interface: Parallel or serial
Suggested List Price: $279.00, plus $149.00 for interface kit
Distributor: CDI Computers Distribution Inc.
Dealer: Exceltronix

Olivetti PR-17B

Manufacturer: Olivetti OPE
Type: Dot matrix
Pin Matrix: N/A
Graphics: Yes
Pitch: Various
Print Speed: 120 cps
Compatibility: Epson
Carriage/Paper Width: 13 inches
Interface: Centronics parallel standard, RS-232C optional
Suggested Retail Price: $999.00
Distributor: Olivetti

Olivetti PR-341

Manufacturer: Olivetti
Type: Daisy wheel

Printer Survey

Pitch: 10, 12, 15, proportional
Print Speed: 45 cps
Carriage/Paper Width: 16.7 inches
Interface: Centronics parallel
Suggested Retail Price: $2,795.00
Distributor: Olivetti

Pacemark 2410

Manufacturer: Okidata
Type: Dot matrix
Pin Matrix: N/A
Graphics: Yes
Pitch: Various
Print Speed: 350 cps draft, 85 LQ
Downloads: Yes
Compatibility: IBM
Carriage/Paper Width: 13.5
Interface: Parallel or serial
Suggested List Price: $3,788.00
Distributor: CDI Computer Distribution Inc.

Panasonic KX-P1093

Manufacturer: Matsushita Electric of Canada
Type: Dot matrix
Pin Matrix: 9 x 9 draft, 17 x 18 NLQ
Graphics: Yes
Pitch: Various
Print Speed: 160 cps draft, 25-30 cps NLQ
Downloads: Yes
Carriage/Paper Width: 15 inches
Interface: Parallel standard, serial optional
Suggested List Price: $995.00
Distributor: Gentek Computers

Panasonic KX-P3151

Manufacturer: Matsushita Electric of Canada
Type: Daisy wheel
Pitch: 10, 12, 15
Print Speed: 22 cps
Carriage/Paper Width: 15.5 inches
Interface: Parallel standard, serial optional
Suggested List Price: $999.00
Distributor: Gentek

PC Compact Printer

Manufacturer: IBM
Type: Dot matrix, thermal
Pin Matrix: 9 x 9
Pitch: Various
Print Speed: 50 cps
Downloads: Yes
Carriage/Paper Width: 8.5 inches
Interface: Serial
Suggested Retail Price: $259.00
Distributor: IBM Product Centres, authorized dealers

Pinwriter P2/P3

Manufacturer: NEC Information Systems
Type: Dot matrix
Pin Matrix: 2 x 9
Graphics: Yes
Pitch: 10, 12, 17
Print Speed: 180 cps data, 90 cps memo, 30 cps NLQ
Downloads: Yes
Carriage/Paper Width: 10 inches (P2), 16 inches (P3)
Interface: Centronics parallel, RS-232C
Suggested List Price: $1,500.00 (P2), $1,900.00 (P3)
Distributor: Zentronics

PowerType

Manufacturer: Star Micronics
Type: Daisy wheel
Pitch: 10, 12, 15, proportional
Print Speed: 18 cps
Carriage/Paper Width: 13 inches
Interface: Centronics parallel and RS-232C
Suggested Retail Price: $766.00
Distributor: Compuserve

Printek 920 SPC

Manufacturer: Printek
Type: Dot matrix
Pin Matrix: 12 x 9 draft, 24 x 18 NLQ
Graphics: Yes
Pitch: Various
Print Speed: 340 cps draft, 80 cps NLQ
Downloads: Yes
Carriage/Paper Width: 16 inches
Interface: Parallel and serial
Suggested Retail Price: $3,539.00
Distributor: Compuserve

Proprinter

Manufacturer: IBM
Type: Dot matrix
Pin Matrix: N/A
Graphics: Yes
Pitch: Various
Print Speed: 200 cps data, 100 cps draft, 40 cps NLQ
Downloads: Yes
Carriage/Paper Width: 11 inches
Interface: IBM parallel standard, serial optional
Suggested Retail Price: $869.00
Distributor: IBM Product Centres, authorized dealers

ProWriter 24QL

Manufacturer: C.Itoh
Type: Dot matrix
Pin Matrix: 9 x 7
Graphics: Yes
Pitch: Various

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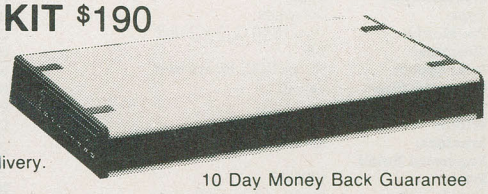

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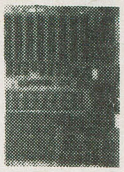

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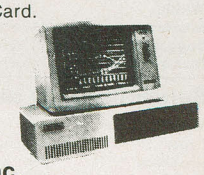

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47 W. Broadway, Vancouver, B.C. V5Y 1P1 Phone: (604) 879-5012
IBM (Trademark IBM Canada Ltd. (Apple-trademark Apple Computers Inc.)

Printer Survey

Print Speed: 200 cps draft, 67 LQ
Carriage/Paper Width: 15.5 inches
Interface: Centronics parallel or RS-232C
Suggested List Price: $2,195.00
Distributor: C.Itoh
Dealer: Norango

Quietwriter

Manufacturer: IBM
Type: Dot matrix
Pin Matrix: 9 x 9
Pitch: 10, 12, 15, proportional
Print Speed: 40-60 cps
Downloads: Yes
Carriage/Paper Width: 15 inches
Interface: Parallel
Suggested Retail Price: $2,299.00
Distributor: IBM Product Centres, authorized dealers

Roland PR-1010A

Manufacturer: Roland
Type: Dot matrix
Pin Matrix: 5 x 9
Graphics: Yes
Print Speed: 80-96 cps
Carriage/Paper Width: 10 inches
Interface: Parallel standard, RS-232C optional
Suggested Retail Price: $399.00
Distributor: Amdek Electronics Canada

Roland PR-2022

Manufacturer: Roland
Type: Daisy wheel
Pitch: 10, 12, 15, proportional
Print Speed: 22 cps
Carriage/Paper Width: 15.5 inches
Interface: Parallel standard, RS-232C optional
Suggested Retail Price: $749.00
Distributor: Amdek

Scribe

Manufacturer: Apple
Type: Dot matrix
Pin Matrix: 12 x 15 NLQ, 9 x 7 draft
Graphics: Yes
Print Speed: 50 cps NLQ, 80 cps draft
Character Sizes: Various
Carriage/Paper Width: Up to 10 inches
Interface: RS-232C
Suggested Retail Price: $470.00
Distributor(s): Apple, authorized dealers

Silver Reed EXP 770

Manufacturer: Silver Reed America
Type: Daisy wheel
Pitch: 10, 12, 15, proportional
Print Speed: 36 cps
Compatibility: Diablo 630
Carriage/Paper Width: 17 inches
Interface: Parallel or serial
Suggested Retail Price: $1,995.00
Distributor: Printerm

Spinwriter Elf 360/370

Manufacturer: NEC Information Systems
Type: Daisy wheel
Pitch: 10, 12, 15, proportional
Print Speed: 19 cps
Compatibility: Diablo
Carriage/Paper Width: 13 inches
Interface: Centronics parallel and RS-232C
Suggested List Price: $1,025.00
Distributor: Zentronics

Spinwriter 3500 series

Manufacturer: NEC Information Systems
Type: Daisy wheel
Graphics: Yes
Pitch: 10,12,15,proportional
Suggested List Price: $3,300.00
Distributor: Zentronics

Sprint 11 Plus series

Manufacturer: Qume
Type: Daisy wheel
Pitch: 10, 12, 15, proportional
Print Speed: Up to 90 cps
Carriage/Paper Width: Up to 15 inches
Interface: Parallel and serial
Suggested Retail Price: Up to $4,595.00
Distributor: Datamex

Star SG-10/15

Manufacturer: Star Micronics
Type: Dot matrix
Pin Matrix: 9 x 11 draft, 17 x 11 NLQ
Graphics: Yes
Pitch: 10, 12, 17
Print Speed: Up to 120 cps
Downloads: Yes
Carriage/Paper Width: 10 inches (SG-10), 15 inches (SG-15)
Interface: Centronics parallel standard, RS-232C optional
Suggested Retail Price: $459.00 (SG-10), $766.00 (SG-15)
Distributor: Compuserve

StarWriter F10-40/55

Manufacturer: C.Itoh
Type: Daisy wheel
Pitch: Various
Print Speed: 40 cps (F10-40), 58 cps (F10-55)
Carriage/Paper Width: Up to 15 inches
Interface: Centronics parallel, RS-232C
Suggested Retail Price: $2,075.00
Dealer: Computron

Tandy DMP 2200

Manufacturer: Tandy Corporation
Type: Dot matrix
Pin Matrix: 9 x 9 draft, 17 x 18 NLQ
Graphics: Yes
Pitch: Various
Print Speed: 380 cps draft, N/A NLQ
Downloads: N/A
Carriage/Paper Width: 16 inches
Interface: N/A
Suggested Retail Price: $2,195.00
Distributor: Radio Shack Computer Centres, dealers

TeleVideo TP 750

Manufacturer: TeleVideo Systems
Type: Daisy wheel
Graphics: Yes
Pitch: 10, 12, 15
Print Speed: 42 cps
Compatibility: Diablo
Carriage/Paper Width: 15 inches
Interface: Centronics parallel
Suggested Retail Price: N/A
Distributor: CDI Computer Distribution Inc.

TEO DWX 305

Manufacturer: TEO
Type: Daisy wheel
Pitch: Various
Print Speed: 18 cps
Carriage/Paper Width: 13 inches
Interface: Centronics parallel, RS-232C
Suggested Retail Price: $599.00
Distributor: TEO Computers and Peripherals

TEO PX-80

Manufacturer: TEO
Type: Dot matrix
Pin Matrix: 8 x 9
Graphics: Yes
Pitch: Various
Print Speed: 80 cps
Compatibility: Epson
Carriage/Paper Width: 10 inches
Interface: Centronics parallel standard, RS-232C optional
Suggested Retail Price: $459.00
Distributor: TEO Computers and Peripherals

Texas Instruments 850 XL

Manufacturer: Texas Instruments
Type: Dot matrix
Pin Matrix: 9 x 9 draft, 32 x 18 LQ
Graphics: Yes
Pitch: Various
Print Speed: 150 cps draft, 35 cps LQ
Carriage/Paper Width: 11 inches
Interface: Parallel and serial
Suggested List Price: $895.00
Distributor: Texas Instruments

Texas Instruments 860 XL

Manufacturer: Texas Instruments
Type: Dot matrix
Pin Matrix: 9 x 9 draft, 32 x 18 LQ
Graphics: Yes
Pitch: Various
Print Speed: 150 cps draft, 35 cps LQ
Carriage/Paper Width: 16 inches
Interface: Parallel and serial
Suggested List Price: $1,295.00
Distributor: Texas Instruments

Toshiba P351

Manufacturer: Toshiba
Type: Dot matrix
Pin Matrix: 24 pins
Graphics: Yes
Pitch: 10, 12, 16.7
Print Speed: 288 cps draft, 100 cps LQ
Downloads: Yes
Carriage/Paper Width: 15 inches
Interface: Centronics parallel, RS-232
Suggested List Price: $2,495.00
Distributor: Genamation

Toshiba P1340

Manufacturer: Toshiba
Type: Dot matrix
Pin Matrix: 24 x 9 draft,24 x 36 LQ
Graphics: Yes
Pitch: 10, 12, 16.7, proportional
Print Speed: 144 cps draft, 54 cps LQ
Carriage/Paper Width: 10 inches
Interface: Parallel or RS-232C
Suggested Retail Price: $1,195.00
Distributor: Genamation

Twinriter5 HR-35DD

Manufacturer: Brother
Type: Dot matrix and daisy wheel
Pin Matrix: 9 x 9
Graphis: Yes
Pitch: Various
Print Speed: Daisy wheel 36 cps; 140 draft, 17 NLQ dot matrix,
Carriage/Paper Width: Up to 16.5 inches
Interface: Centronics parallel or RS-232C
Suggested Retail Price: $2,737.00
Distributor(s): SAK Data

Wheelprinter

Manufacturer: IBM
Type: Daisy wheel
Pitch: 10, 12, 15, proportional
Print Speed: 25 cps
Carriage/Paper Width: Up to 15.4 inches
Interface: Centronics parallel or RS-232C
Suggested Retail Price: $2,969.00
Distributor: IBM Product Centres, authorized dealers

Printer Survey

Word/Scribe WP-6000

Manufacturer: Anadex
Type: Dot matrix
Pin Matrix: 2 x 9
Graphics: Yes
Pitch: Various
Print Speed: 275 cps draft, 150 cps LQ
Downloads: Yes
Carriage/Paper Width: 15 inches
Interface: Parallel and serial
Suggested Retail Price: $4,200.00
Distributor: Printerm

Uchida CPB series

Manufacturer: Uchida, for TEO
Type: Dot matrix
Pin Matrix: 9 x 9
Graphics: Yes
Pitch: Various
Print Speed: 130 cps
Downloads: Yes
Carriage/Paper Width: Up to 13.6 inches
Interface: Centronics parallel or RS-232C
Suggested Retail Price: $649.00
Distributor: TEO Computers and Peripherals

Yamaha PN-101

Manufacturer: Yamaha
Type: Dot matrix
Pin Matrix: 9 x 7
Graphics: Yes
Pitch: Various
Print Speed: 40 cps
Downloads: Yes
Carriage/Paper Width: 8.5 inches
Interface: CB-01 cable to Yamaha or MSX personal computer
Suggested Retail Price: $450.00
Distributor: Yamaha Music Canada

Inkjet and Laser Printers

Canon PJ-1080A

Manufacturer: Canon Canada
Type: Inkjet
Pin Matrix: 5 x 7
Graphics: Yes
Print Speed: 37 cps
Pitch: Various
Carriage/Paper Width: 8.5 inches
Interface: Centronics 8-bit parallel
Suggested Retail Price: $1,065.00
Distributor(s): Canon Canada

Color Jetprinter

Manufacturer: IBM
Type: Inkjet
Pin Matrix: 100 x 72 draft, 100 x 96 NLQ
Graphics: Yes
Pitch: Various
Print Speed: 20 to 50 cps
Downloads: Yes
Carriage/Paper Width: 8.5 inches
Interface: IBM parallel
Suggested Retail Price: $1,199.00
Distributor: IBM Product Centres, authorized dealers

Epson SQ-2000

Manufacturer: Epson
Type: Injet
Pin Matrix: 37 x 17
Graphics: Yes
Pitch: Various
Print Speed: 176 cps draft, 106 cps LQ
Downloads: Yes
Carriage/Paper Width: 16 inches
Interface: Parallel and serial
Suggested List Price: $3,795.00
Distributor: Epson Canada

LaserJet

Manufacturer: Hewlett-Packard
Type: Laser
Pin Matrix: 300 x 300
Graphics: Yes
Pitch: Various
Print Speed: Up to 8 pages per minute
Downloads: Yes
Carriage/Paper Width: 8.5 inches
Interface: HP-IB, RS-232C
Suggested List Price: $5,782.00
Distributor: Hewlett-Packard

LaserWriter

Manufacturer: Apple
Type: Laser
Pin Matrix: 300
Graphics: Yes
Pitch: Various
Print Speed: Up to 8 pages per minute
Downloads: Yes
Carriage/Paper Width: 8.5 inches
Interface: RS-232C
Suggested Retail Price: $10,995.00, including AppleTalk
Distributor(s): Apple, authorized dealers

Multiwriter V

Manufacturer: Ahern and Soper
Type: Laser
Pin Matrix: N/A
Graphics: Yes
Pitch: Various
Print Speed: 8 pages per minute
Downloads: Yes
Compatibility: Epson, Diablo, Qume, NEC
Carriage/Paper Width: 8.5 inches
Interface: Parallel or serial
Suggested List Price: $,6,655.00
Distributor: Ahern and Soper

QuadLaser

Manufacturer: Quadram
Type: Laser
Pin Matrix: N/A
Graphics: Yes
Pitch: Various
Print Speed: Up to 330 cps LQ
Downloads: Yes
Compatibility: Epson, Qume
Carriage/Paper Width: 8.5 inches
Interface: Centronics parallel or RS-232C
Suggested Retail Price: $5,890.00
Distributor: Chevco Computing

Siemans PT88/89

Manufacturer: Siemans Electric Limited
Type: Inkjet
Pin Matrix: 12 x 9
Graphics: Yes
Pitch: 10, 12, 17
Print Speed: 150 cps draft, 80 cps NLQ
Downloads: Yes
Carriage/Paper Width: 10 inches (PT88), 15 inches (PT89)
Interface: Centronics parallel or RS-2332C
Suggested Retail Price: PT88- $990.00 parallel, $1,025.00 serial; PT89- $1,290.00 parallel, $1,325.00 serial
Dealer: OFECS International, Toronto

Smartwriter

Manufacturer: QMS
Type: Laser
Pin Matrix: 300 x 300
Graphics: Yes
Pitch: Various
Print Speed: 8 pages per minute
Downloads: Yes
Compatibility: Epson, Qume, Diablo
Carriage/Paper Width: 8.5 inches
Interface: Centronics parallel or RS-232
Suggested Retail Price: $6,495.00
Distributor: Watson Computer Products

ThinkJet

Manufacturer: Hewlett-Packard
Type: Inkjet
Pin Matrix: 11 x 12
Graphics: Yes
Pitch: Various
Print Speed: 150 cps
Carriage/Paper Width: Up to 10 inches
Interface: HP-IB, HP-IL, Centronics parallel, RS-232C
Suggested List Price: $840.00
Distributor: Hewlett-Packard

Xerox 4045 Laser CP

Manufacturer: Xerox
Type: Laser
Pin Matrix: 300 x 300
Graphics: Yes
Pitch: Various
Print Speed: Up to 10 pages per minute
Downloads: Yes
Carriage/Paper Width: 8.5 inches
Interface: Centronics parallel, RS-232C
Suggested List Price: $7,450.00
Distributor: Xerox Canada

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A Brush with PROLOG

Artificial Intelligence programming languages are strange and complex things. Here's a look at one of the strangest.

by Frank Lenk

BASIC is a good all purpose language. It makes a great control environment for a microcomputer, and it's not half bad for creating applications programs. Of course, if you plan on creating a work of enduring greatness, machine or assembly code is much tighter and faster. Then again C or Pascal is a lot less tedious for those really monumental tasks.

All these languages have one thing in common. Programs written in any of these dialects are meant to execute sequentially, statement by statement, module by module. The programmer must specify each step in the process.

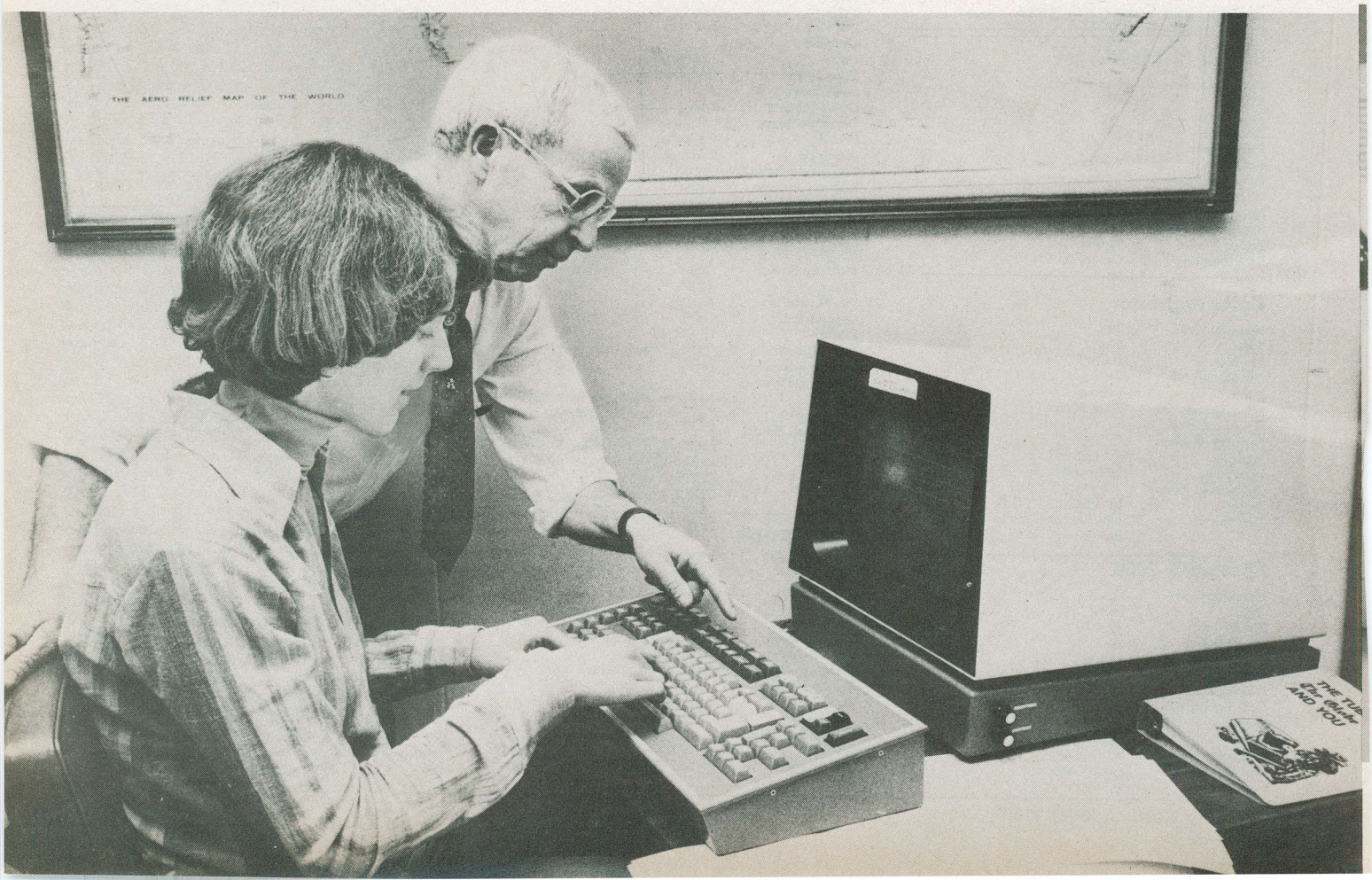
Because of this need to be tediously explicit, the garden variety microcomputer languages have largely been left behind by those select few great intellects involved in artificial intelligence research. The mental giants are trying to develop something that runs a little closer to the natural human reasoning process, and even does a lot of anticipating and cogitating on its own. So far, they've come up with two chief solutions, these being PROLOG and LISP.

LISP is the better known of the two, especially in North America. The beauty of LISP... from the AI point of view... is that it readily incorporates *meta programming*, the ability of programs to write programs. LISP stands for *list processing*. LISP statements and LISP data are treated alike, as lists of elements. A program can easily create new lists that can in turn be executed... provided, of course, that they do make some sense as program statements.

PROLOG, for *programming in logic*, was the language preferred by the Japanese for their fifth generation computer project. The language was originally written in 1973 in Marseilles, France, in FORTRAN. A far more efficient version was produced at the University of Edinburgh in 1977.

Like LISP, PROLOG is also capable of meta programming. However, logic is definitely its forte. If you recall anything about the basic idea of logical syllogisms, you'll be a good way along to grasping PROLOG.

There's a company in Toronto that has developed one of the leading PROLOG systems yet available. Logicware kindly provided me with a copy of their pride and joy, MPROLOG. What follows are the results of a brief test ride.



Environmental Factors

The MPROLOG manual suggests the analogy that conventional programming is like telling a technician what to do, while PROLOG programming is much more like talking to an engineer. That is, a program is usually a set of detailed instructions, to be carried out in sequence. A PROLOG program looks more like a job specification, describing the basic conditions and the desired type of solution.

The result of the PROLOG approach is two fold. First, it makes certain types of logical programming very easy. Second, it makes virtually all PROLOG programming almost unbelievably baffling to someone who is already used to programming the old fashioned way. It's doubly difficult to get a good handle on what PROLOG really is because much of what's been written about it so far has been written by folks who actually consider this to be an intuitively obvious way to program. I think these people have green skins and antennae.

To complicate matters still further, the Logicware MPROLOG system was created by mainframe programmers, and only later ported down to the lowly IBM PC. The mainframe origins are obvious on account of the system's hardware appetite... it needs a half megabyte of RAM... and its peculiar line editing facility, called PDSS, for PROLOG Development Support System. There are also a lot of features still pending on the PC incarnation... notably modularity, the M in MPROLOG. A lot of this extra stuff is due to be included in the next release... coming soon.

Booting PDSS presents you with a colon prompt and little else. Eventually you may discover that the command *help* actually does provide considerable respite from the blankness of the PDSS screen. There's help available on lots of topics. The help messages combine compactness and lucidity in a way that makes them perhaps more valuable than the enormous MPROLOG manual.

Horribly, you'll find that no program commands can be entered at the PDSS prompt. After considerable struggle you might realize that program entry has to be specifically initiated in one of two ways, either statement by statement, using the e, for *enter* command, or *en masse*, beginning with the b, or *body* command. The latter is the easiest method of actually cramming a program into the system.

Editing is a whole other kettle of piranha. To get into edit mode you must first tell the package to f, or *focus* or at least specify a particular part of your program. Since MPROLOG is not into line numbers, you do this by specifying a *selector* parameter. Once you figure out what a selector is you get thrust into a fairly straightforward line editor.

MPROLOG statements are designated by their name, followed by a slash and the number of parameters they use, optionally followed by a plus sign and a number. The parameter argument is needed, since PROLOG allows you to use a single name for functions with varying numbers of parameters. The plus sign numbering tells PROLOG that you want, say, the fifth or sixth statement with the specified name. The following is typical.

```
edit rip_out_my_spleen/2+3
```

In the editor mode, all the normal DOS function keys do their usual stuff. Thus you can use F3 to retype a line, *Ins* and *Del* to add or remove characters, and so on. Since a single definition can consist of many lines, the editor adds line numbers and lets you use the command m, for *modify* to attack a single line. However, there are hidden perils. For instance, if you use the editor d... *delete* command to erase all your program statements and then attempt to exit back to the program entry level, the PDSS editor will come back with *unexpected end of source, '.' expected'* and flatly refuse to let you go.

I eventually found that the top level has insert and delete commands of its own, that circumvent this problem.

The mode levels of MPROLOG are generally a pain. You can enter commands at the top level prompt, but you can't enter program statements. From the body level you can enter statements, but you can't enter commands or edit. Leaving the editor you don't know which of the other two levels you're in, since they all use the same colon prompt.

Still, perseverance pays off. Once you grasp a few of these twists things do get much easier. The PDSS environment is obviously designed to keep the programmer on the straight and narrow. It serves that purpose reasonably well, as long as you keep careful track of what it's doing. MPROLOG saves and reads programs as text files, so I think you could bypass the editorial process by word processing your own source. Unless you're red hot with MPROLOG syntax, however, this probably would get you into even more trouble.

Subject to Interpretation

You may wonder what a PROLOG program looks like. In fact, it's like nothing you've ever seen before. PROLOG is *weird*.

Like BASIC, PROLOG is meant to be interpreted, its source code evaluated one statement at a time. The complete mainframe MPROLOG system does include a compiler, but this wasn't part of the current PC release.

PROLOG programs look more like a database than like a set of instructions. A complete program is a logical description of a system. The programmer lays out the problem and it's up to PROLOG to figure out how to solve it.

In practice you'd probably start out by defining some simple facts followed by some rules about how these facts relate to each other. In the end you could either query the database, much as you might a database written in a language like dBase, or build a goal directly into the program. Adding a goal means you can run the program to produce a specific desired result.

PROLOG programs are made up of definitions consisting of a name, or *predicate*, and a bracketed list of arguments, followed by a period, like so...

```
bizarre(prolog).
```

This implies that PROLOG is bizarre. Rules are like definitions, but embody some relational information.

```
understand(prolog) if
        warped(mind) and
        IQ > 200.
```

Let's charge right in and look at a simple program. F'rinstance:

```
module unnamed_module.
/*$eject*/
body.
continent(europe,france) .
continent(europe,italy) .
continent(america,canada) .
continent(asia,china) .

capital(france,paris) .
capital(italy,rome) .
capital(canada,ottawa) .
capital(china,peking) .
capital(usa,washington) .

endmod /* unnamed_module */  .
```

This sort of thing could go on forever... like most database, it's open ended. You could query this database.

```
? capital(canada,X).
```

or

```
? capital(X,Y) and continent(europe,X).
```

Note that arguments are usually in lowercase. Beginning an argument in uppercase indicates a variable. In the first case,

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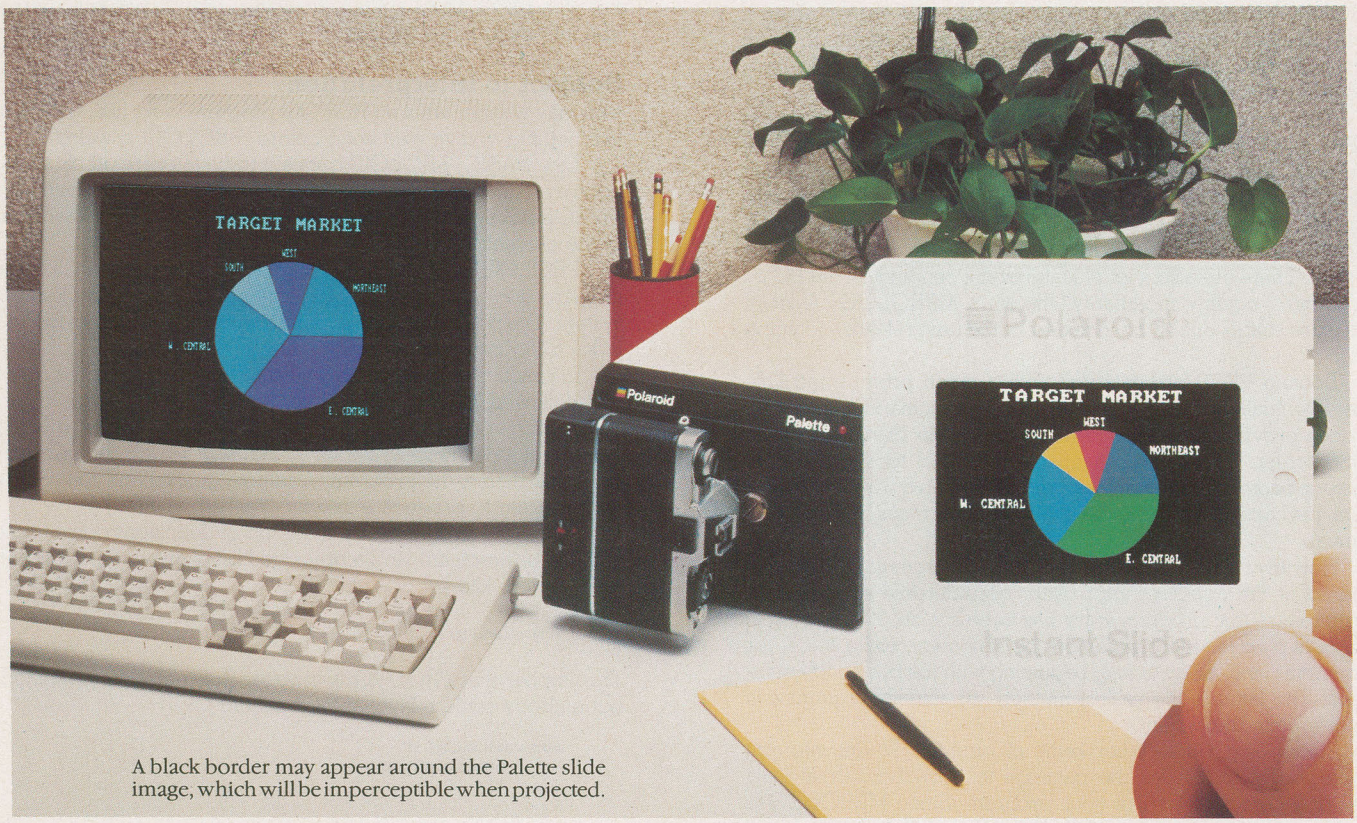

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PROLOG tries to match your query statement within its database, substituting as required for the variable X and hopefully returning the only valid answer, *ottawa*. In the second example PROLOG tries to substitute for X but finds itself constrained by a second criterion. Having found a suitable X, PROLOG can then finally try for a matching Y. The search yields... one at a time... all the capitals of the European countries. That is, all the ones you've entered into the database.

In the listing shown you can safely ignore all the stuff in slash and asterisk marks. Those are comments, as they are in C. The *module* statement starts a program block, while *body* starts the program proper. I never did figure out what the *eject* was for, but it seems harmless.

PROLOG variables are not really synonymous with the variables you get in other languages. The main difference is that in PROLOG you never re-assign values to variables. PROLOG itself will usually be trying various substitutions for a variable, but the programmer is shielded from this process. You would never say something like *LET X=X+1* in PROLOG for two reasons. Firstly, X can't be re-assigned and secondly, you'd have very little reason to implement this kind of counter structure in a language where flow control is none of your business.

This doesn't mean you can't do math, if you're so inclined. Entering the following...

```
e(X) if X is 7*(2+12).
? e(X).                    { your query }
```

returns the response:

```
X = 98
```

Again, the parallel with dBase is helpful. You use numbers mostly in deriving information from the given data.

FOR NEXT, GOTO and similar flow control structures are just a faded memory in PROLOG. Instead of looping, PROLOG gets off on recursion. In a normal language, recursion generally means having a procedure call itself. Many languages don't allow this sort of abuse. PROLOG encourages it. In PROLOG you frequently define a rule in terms of itself.

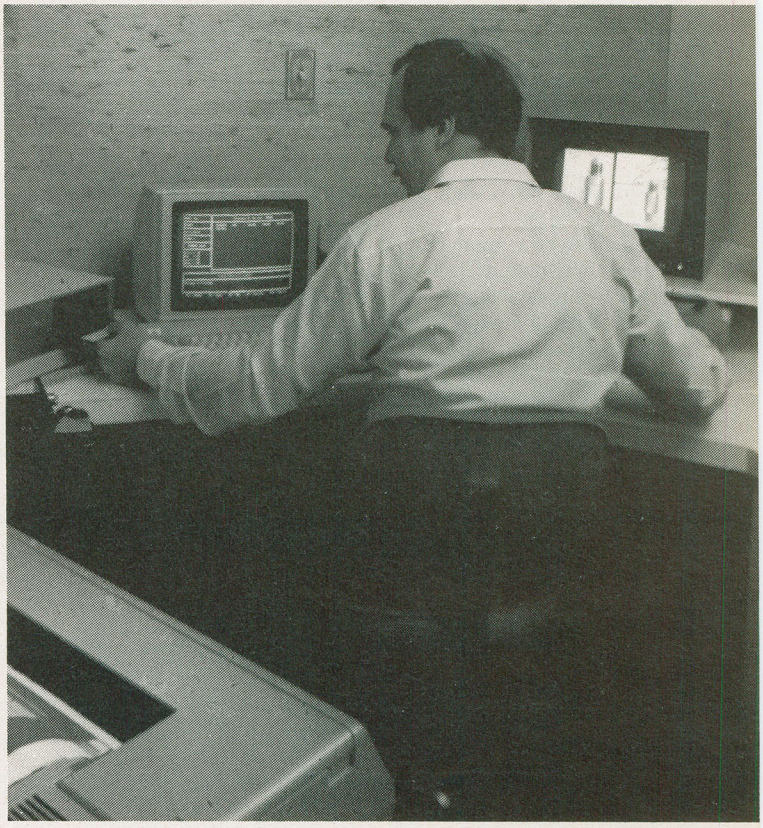
For instance, suppose you wanted to define a PROLOG predicate that would calculate the sum of an arbitrarily long list of numbers. The sum of a list can be defined as "the value of the first element of the list plus the sum of the remainder of the list". This circular definition doesn't seem to get us very far, but in fact it solves the whole PROLOG problem... thus:

```
module list_sum.

/*$eject*/
body.

lsum([],0) .
lsum([H|T],S) :-
        lsum(T,P), S is H+P .
endmod /* list_sum */  .
```

Notice that the commas in MPROLOG are synonymous with"and". In fact, MPROLOG will substitute commas when you enter "and". Similarly, the odd little colon hyphen mark stands for "if"... or better yet, "is implied by".

This little program actually embodies a bunch of PROLOG features. Here's how it works. First, we handle the special case of the empty list, "[]", which should have an arithmetic value of zero. Then there's the notation [H|T]". This is fundamental to how PROLOG handles lists. Using the "|" operator splits the list into a *head* H and a *tail* T. The head is the first element of the list, the tail a new list containing everything but the former head.

To find the sum we first define the intermediate result P as the sum of the tail of the original list. When PROLOG tries to find the "lsum" of P it discovers that the tail T is a list in itself. So it hustles back to the start of the definition... where you told it the definition of "lsum"... and tries the whole thing again, this time with the list T.



It finds the head of T, then tries to evaluate P for the new tail, the tail of T. Eventually there's nothing left of the original string except the empty list. At this point PROLOG finds you've already defined the sum of that list as zero, so it works back forward.

Here's a complete run through, using MPROLOG's trace function:

```
trace ~                      { trace all (~)       }
lsum/2 TRACED.             { MPROLOG~s response }
       ? lsum([1,2,3],X).        { your query!    }
       > lsum([1,2,3],_813)    { MPROLOG~s display..}
        > lsum([2,3],_965)                    .
         > lsum([3],_1111)                    .
          > lsum([],_1257)                    .
           + lsum([],0)                       .
          + lsum([3],3)                       .
         + lsum([2,3],5)                          .
        + lsum([1,2,3],6)                         .
           X = 6           { MPROLOG~s answer   }
        Continue (y/n) ? { want another?       }
        y                  { OK, why not.   }
        < lsum             { tracing again...   }
         < lsum                                   .
          < lsum                  .
           < lsum                 .
           - lsum                 .
          - lsum                  .
         - lsum                                   .
        - lsum                                    .
        NO                 { no luck this time  }
```

Without getting bogged down in detail, a couple of things can be noted. First, regarding variables: you can see that your query variable, X, vanishes as soon as PROLOG gets hold of it. The numbers you see preceded by an underline character are presumably references to where MPROLOG is stashing intermediate values.

The leading right arrow indicates that PROLOG is evaluating the statement. A plus sign means that it has succeeded. In the first sequence you can easily see how the system strips your list down to nothing, then starts back up armed with the correct sums.

A leading left arrow means that MPROLOG is backtracking and re-evaluating. The dash means that it has given up on a statement... "failed", in the correct jargon.

PROLOG always lets you try for a second match of your query condition, until the search covers the whole database and fails totally. In this case it's to be hoped that there's only one right answer to be found. However, if you searched our first sample database...

```
? continent(europe,X).
```

it's obvious that you'd want to find all the cases of capitals that do in fact lie in Europe.

Recursive programming is a bear to get used to, but it does suit some applications rather well. An example provided by Logicware concerns the well known Quicksort. First they show a quicksort implemented as over fifty lines of generic Pascal. Then there's the equivalent MPROLOG:

```
quicksort([],[]).
quicksort([HEAD|TAIL],RESULT) if
  partition(HEAD,TAIL,LEFT,RIGHT) and
  quicksort(LEFT,SORTED-LEFT) and
  quicksort(RIGHT,SORTED-RIGHT) and
  append(SORTED-LEFT,[HEAD|SORTED-RIGHT],RESULT).
partition(ELEMENT,[],[],[]).
partition(ELEMENT,[HEAD|TAIL],[HEAD|LTAIL],RTAIL) if
  HEAD < ELEMENT and
  partition(ELEMENT,TAIL,LTAIL,RTAIL).
partition(ELEMENT,[HEAD|TAIL],LTAIL,[HEAD|RTAIL]) if
  HEAD >= ELEMENT and
  partition(ELEMENT,TAIL,LTAIL,RTAIL).
```

There's not really space enough to detail the execution of this program, but the generalities should begin to become apparent. The operation is split into the equivalent of subroutines. The second block defines the operation "partition"... used by the main definition, "quicksort". Both blocks begin by dismissing the special case of the empty list. This is the boundary condition. Recursion reaches its greatest depth and comes back up for air once it reaches this value.

You may note with admiration the degree of recursion used in this program. The function "quicksort" depends on splitting the input list into left and right segments, then quicksorting both of these. Eventually the built in predicate "append" is used to join the sorted left and right halves into the list "result". You'd query the program thus...

```
? quicksort([2,5,1,6,3],X).
```

You'd get back something like:

```
X = [1,2,3,5,6]
```

Central Intelligence

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BUGS is a weird little ASCII game. Using the cursor pad one zaps a nuclear fly swatter around the screen blowing up this long crawling bug. It's a scream.

CLOCK is a useful tutorial in writing character oriented device drivers for the PC, as well as being an improved replacement clock.SYS file for many real time clocks. The ASM file is included.

CRYPTO is a BASIC program which descrambles cryptograms. It's an interesting study for puzzle freaks.

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DOSEDIT is one of the most useful DOS utilities available. It enhances the command line editing facility of MS-DOS by creating a command stack. Now, rather than just being able to recall the last command with F3 the cursor arrows allow you to scroll through a whole stack of previous commands, re-executing the ones you need.

DUMP is a program to produce hex dumps of object files. It's both useful in its own right and a good example of how to use the DOS disk service calls. The ASM file is also included.

FREE is a very tiny file that tells you how much free space you have on a disk . . . without watching a whole directory listing scroll by. It's especially handy on hard drives.

KBFIX displays the status of the keyboard lock keys on the screen and makes the keyboard's character buffer longer to avoid losing bytes.

LABEL changes the labels on drive volumes. It's a simple thing, but useful if you use the labels to keep track of your disks.

LIST is an improvement over TYPE. It shows you the contents of a file with paging, and in a much more civilized fashion.

MEMBRAIN is the most sophisticated RAM disk program we've seen yet. It allows for variable sized disks and a number of other parameters.

MONOCLOK is a screen clock displays program to work on PCs with monochrome displays.

MOVE is a program which moves and optionally erases files. However, you can have it query you about wild cards, such that you don't have to move all the files specified by a wild card. It's very useful.

NEWBELL is a tiny germ of code which changes the sound of the PC's control G beep. It's almost useless, but it's very small.

NUSQ is a file urtsqueezer. It's a particulary useful for people who download squeezed files from bulletin boards and need a way to get them unsquozen.

PARCHK is trap to keep the system from locking up and saying "parity error" every time one of these little nasties comes down. It gives you the option of finding out what caused the error and recovering from it.

PURGEDUP is a very sophisticated program for killing off obsolete backup files. It's of great use on a hard drive . . . which tends to get filled up with abandoned files quite easily.

PX is a cross reference generator for assembler programs. It helps you keep track of where you put procedures in large files.

QS is a DOS patch which eliminates the wait one normally experiences while the PC checks out its brains prior to booting. It's not compatible with everything, but it's still extremely handy.

SDIR is an improved sorted directory program.

SP is a very clever print spooler. It will allow you to print files into a RAM buffer and have the PC send them to the printer in the background while you move on to other things.

SPACEINVADERS This a bit of variation on the popular arcade game, but it's fast and the graphics are superb. Green blood will ooze from your drives.

SPEED is a very simple program which changes some of the PC's floppy disk parameters and effectively speeds up the disk accesses for some applications.

VDEL is a multiple file deletion program that queries you prior to snuffing each entry. It's a bit like MOVE but it's much smaller.

WHEREIS will locate a file on a disk even if it lurks in a subdirectory. It's primarily useful on hard disk systems.

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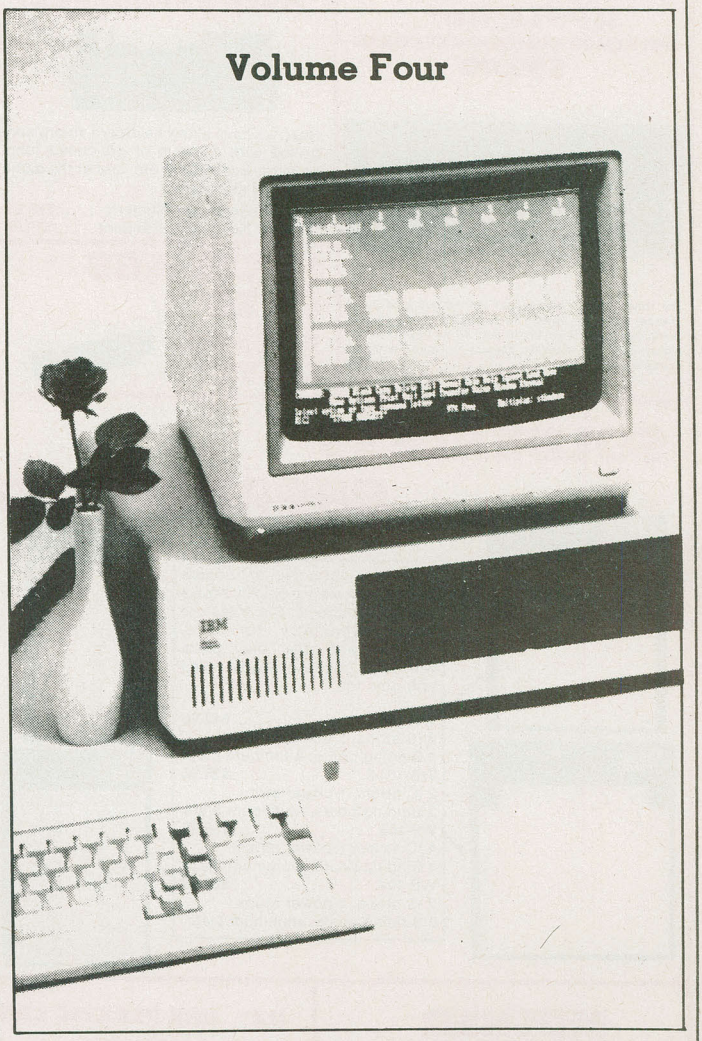

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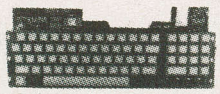

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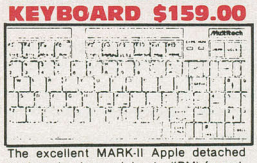

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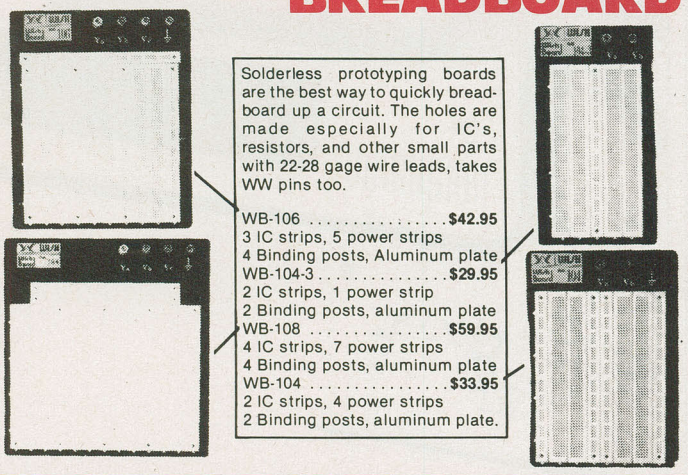

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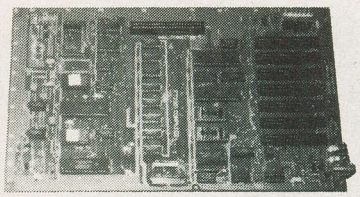

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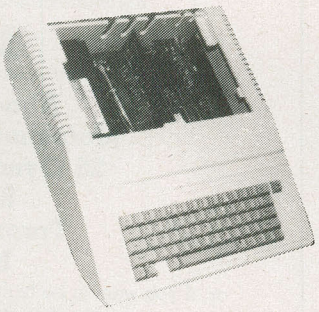

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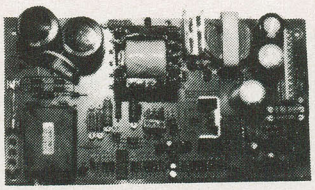

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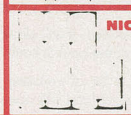

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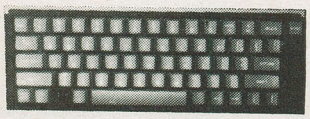

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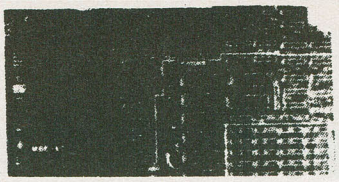

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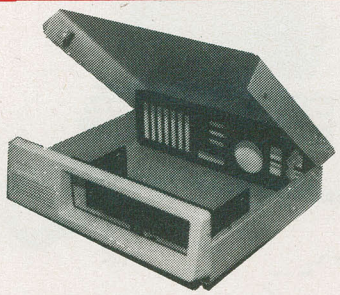

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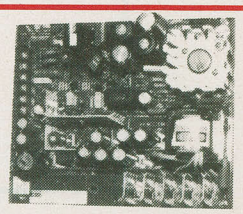

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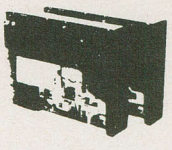

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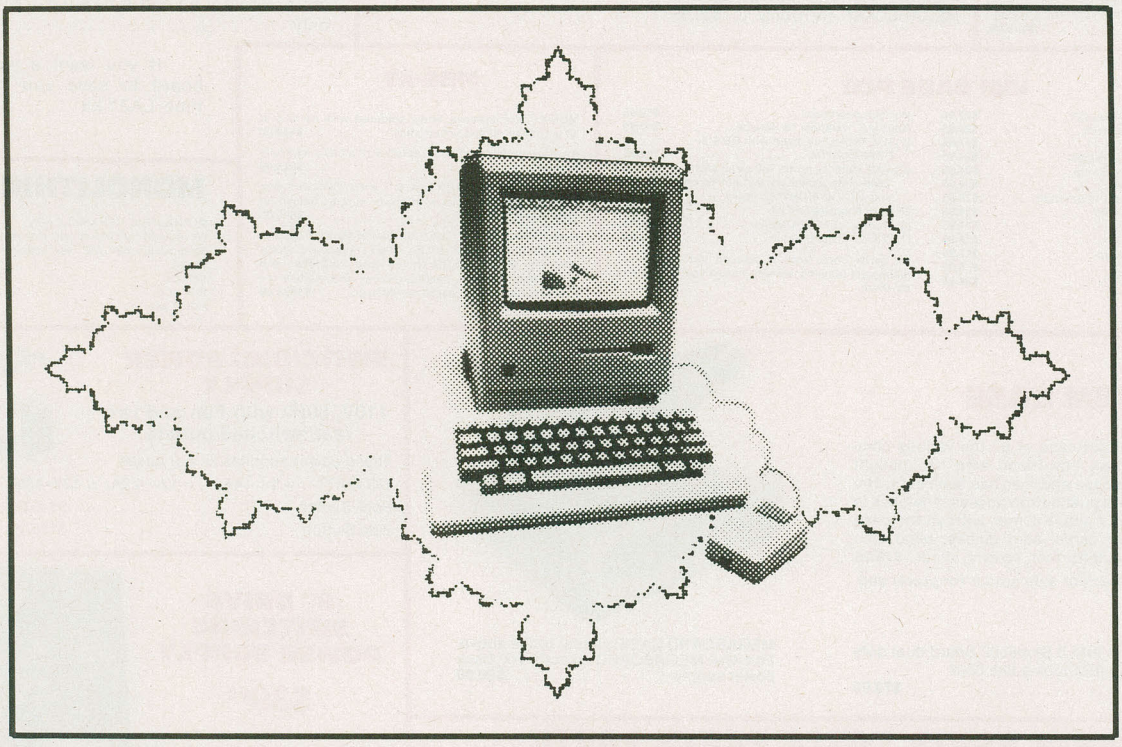
MacFractals

Fractal geometry is an almost mystical aspect of pure mathematics. It tantalizes the imagination and generates visually stunning images. Here's a simple Macintosh application to create fractals.

by Steve Rimmer



Higher mathematics is really only marginally more esoteric than pop music. It has its trendy phenomena just like most of the other things that humans get into. The really wild bit of number juggling at the moment is the theory behind fractal geometry.

Fractal theory started with the work of one Benoit B. Mandelbrot... which is why fractals are more properly referred to as being the result of an examination of the Mandelbrot set. The visual images that one generally thinks of as being fractals... if one spends a lot of time thinking about such things... are actually plots of fragments of that area of the complex number plane that contains the Mandelbrot set. Despite their often organic appearance, fractals are generated by purely mathematical means.

In looking at complex fractal sections one can't help wondering if fractal geometry isn't some sort of biological plan for living organisms.

The program in this article is a fractal generator for the Macintosh. It produces visual representations of the results of solving for various parts of the Mandelbrot set. Because the Mac's screen offers us rather finite resolution... while, by its definition the Mandelbrot set is sort of infinite... the program also drives an

optional Hewlett-Packard 7475A plotter to render things in rather more detail in ink. If you've neglected to buy one of these useful peripherals you can still use the program... the menu allows one to disable the plotter function.

Fractals at Sea

Complex numbers will probably be familiar to you if you stayed awake during high school math classes... arguably an extreme effort for so little insight. A complex number consists of two parts, the real part... the part which can be dealt with as we normally handle numbers... and an imaginary part. One simply adds them together to arrive at the complex number in question. A complex number might be represented as

8 + (6 * *i*)

where the eight is the real part and the *i* is a constant which causes the six to be imaginary. The constant is imaginary because if you square it... raise it to the power of two in computer terms... it equals −1. No real number exists which, when squared, equals −1... and hence *i* is referred to as imaginary.

Complex numbers are handled algebraically, just as are simple polynomials.

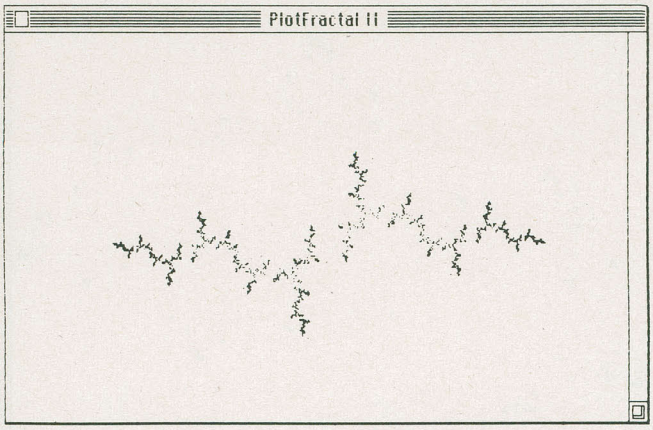
Mathematicians describe the universe of complex numbers as an infinite plane... imagine a sheet of graph paper stretching out in all directions... wherein every complex number corresponds to a point on the plane. One begins to get a feel for what fractals are, then... they're the result of a mathematical process which specifies a set of related points on the complex number plane.

In fact, the expression which defines the Mandelbrot set is pretty simple if you come upon it when it isn't expecting you. It goes

$$z^2 + c$$

in which z is a variable complex number and c is a set of fixed complex numbers.

The process of generating the Mandelbrot set, then, consists of doing the following. Let's start with *z* being the complex number 0 + 0*i*. The square of *z* is zero and, as such, $z^2 + c$ is equal to c.



This is the first result.

If we allow that this result is the new value for *z* and blast it back into the expression, the effective result is having *z* equal to c. The result of this would be

$$c^2 + c$$

This is the second result.

Stuffing this result in place of the tireless *z* in the original expression again we get a new expression once more, this time

$$(c^2 + c)^2 + c$$

This represents the third result. The process, obviously, continues for in infinite number of iterations if one has the time and the scrap paper to handle it.

The Mandelbrot set is a subset of all the numbers generated by this infinite process. The numbers which exist in that set are defined as being values of c in $z^2 + c$ that result in finite values after an infinite number of iterations of the process we've just looked at.

Real Numbers

Using the program in this article doesn't require anything like all this heavy theory... in fact, if you don't care much for the math you can ignore it all together and just watch the pictures show up on the screen.

The program is based on bit of a fudge, actually, which Rod Potter... he edits Software Now!... used in an IBM PC version of this thing. By definition, one should generate fractals by walking through all the numbers in the infinitely large imaginary number plane and checking out which ones are valid members of the Mandelbrot set. This is rather time consuming to say the least. This program actually picks random points and tests them. It's unquestionably cheating, but it generates a recognizable fractal worlds quicker.

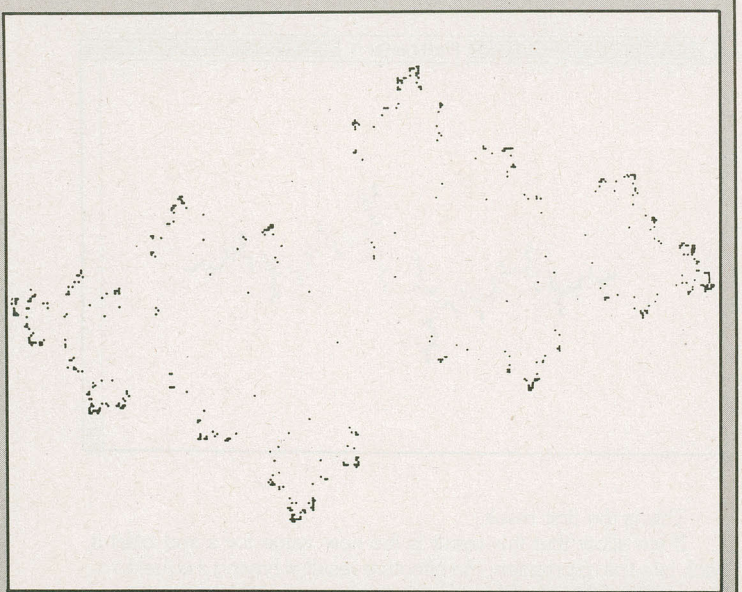
The interesting aspect of this code from a programming point of view is that it also drives a very non-Macintosh device, the Hewlett-Packard 7475A plotter. This strikes one as being a rather nasty enterprise at first, the plotter having its own ideas as to exactly what it wants to be fed as data. However, fortunately, the plotter expects to be talked to over an RS-232C interface... the Mac's modem port is eminently suitable for the task... and the commands one needs to plot individual points aren't really all that involved.

Among the useful bits are IN, for initializing everything, SP1 to grab one of the plotter's six pens, PA*x,y* for moving to a specific point, PU and PD for pen up and down and the most complex looking, LB, to print text. Microsoft BASIC for the Mac has splendid communications handlers built in... although the manual rarely mentions them... and talking to the plotter in this respect is actually dead easy.

When the program boots it will create a new pull down menu called "Fractals". You can enable or disable either the screen or the plotter as display devices... disable the plotter if you don't have one. The plotter test will make the plotter print something...

MacFractals

```
'               FractalMac
'               by Steve Rimmer and Rod Potter
'               Copyright (c) 1985

'               "We traded the dinner set for a Mandelbrot set
'               and now we just don't know where to hang it..."

'               Generates fractals and optionally drives an HP 7475A
'               Plotter connected to the modem port

    TRUE = -1 : FALSE = NOT TRUE

'     Initial status of display options
    ScreenDisplay = TRUE        'set true for screen
    PlotterDisplay = TRUE       'set true to drive HP 7475A plotter

'     Fudge factors for HP Plotter
    Xplot = 20                  'Expansion Factor for plotter
    Yplot = 20                  'Expansion Factor For plotter
    DXplot =10                  'Offset Factor for plotter
    DYplot = 2                  'Offset Factor for plotter

    CentreX = 256 : CentreY = 150 : X = 1 : Y = 0
    LambX = 3 : LambY = 0 : Scl = 1.5

    CLS
'     Make a menu
    GOSUB SetMenu           'Set up fractal menu
    MENU ON : ON MENU GOSUB SeeWhat

KillTime:
    GOTO KillTime:

SeeWhat:
    MenuNumber = MENU(0) : IF MenuNumber <> 6 THEN RETURN
    MenuLine = MENU(1)
    IF MenuLine = 1 THEN ScreenDisplay = NOT ScreenDisplay
    IF MenuLine = 2 THEN PlotterDisplay = NOT PlotterDisplay
    IF MenuLine = 3 THEN GOSUB PlotterTest
    IF MenuLine = 4 THEN GOSUB BigLoop
    IF MenuLine = 5 THEN GOSUB ReplacePen : BEEP : END
    GOSUB SetMenu
    RETURN

BigLoop:                        'This is the main fractal generator
    MENU OFF
    CLS
    GOSUB GrabInput     'get values for lambda and scale
    GOSUB GrabPen       'pick up pen and wake up plotter

    LambdaX = LambX : LambdaY = LambY : Scale = Scl
    S = LambdaX^ 2 + LambdaY^2
    LambdaX = 4 * LambdaX/S
    LambdaY = -4 * LambdaY/S

    Scale = 2 * CentreX/Scale

    I=1
    WHILE NOT MOUSE(0)
        Seconds = VAL(RIGHT$(TIME$,2))
        Minutes = VAL(MID$(TIME$,4,2))
        RANDOMIZE Seconds * Minutes

        TX = X : TY = Y
        X = TX * LambdaX - TY * LambdaY
        Y = TX * LambdaY + TY * LambdaX
        X = 1 - X
        T = Y
        S = SQR(X ^ 2 + Y ^ 2)
        Y = SQR((-X + S)/2)
        X = SQR((X + S) / 2)
        IF T < 0 THEN X = -X
        IF RND(1) < .5  THEN X = -X : Y = -Y
        X = 1 - X : X = X / 2 : Y = Y / 2
        a = Scale * (X-.5) + CentreX : b = CentreY - Scale * Y
        IF ScreenDisplay THEN PSET (a,b),33
        IF PlotterDisplay THEN GOSUB PlotterSwatter
        I = I + 1
        WEND
    CALL MOVETO (120,20)
    CALL TEXTFACE(1)
    IF PlotterDisplay THEN PRINT "Hold On. The plotter is unwinding ."
    CALL TEXTFACE(0)

    GOSUB ReplacePen
    CALL MOVETO (120,20)
    CALL TEXTFACE(1)
    PRINT "Mash the mouse for another fractal."
    CALL TEXTFACE(0)

    BEEP
    WHILE NOT MOUSE(0) : WEND
    MENU ON
    RETURN

ReplacePen:             'Put Plotter To Bed
    IF PlotterDisplay THEN PRINT #1,"SP0;PA0,0; IN;" : CLOSE 1
    RETURN

GrabInput:              'Do an input box
    WINDOW 2,,(10,22)-(280,172),-4
    CALL TEXTFACE(1)
    CALL MOVETO(5,22) : PRINT "Lambda X"
    CALL MOVETO(5,62) : PRINT "Lambda Y"
    CALL MOVETO(5,102) : PRINT "Scale"
    CALL TEXTFACE(0)
    EDIT FIELD 1, STR$(LambX),(5,30)-(150,45)
    EDIT FIELD 2, STR$(LambY),(5,70)-(150,85)
    EDIT FIELD 3, STR$(Scl),(5,110)-(150,125)
    BUTTON 1,1,"OK",(200,129)-(250,147)

        i=1
    Loop:
        d=DIALOG(0)
        IF d=1 THEN Done
        IF d=2 THEN i=DIALOG(2)  : EDIT FIELD i
        IF d=6 THEN done
        IF d=7 THEN i=(i MOD 2)+1
        GOTO Loop
    Done:
        LambX = VAL(EDIT$(1))
        LambY = VAL(EDIT$(2))
        Scl = VAL(EDIT$(3))
        WINDOW CLOSE 2
        RETURN

    PlotterSwatter:                 'Plot a point on the plotter
            PlotDot$ =  "PA" + STR$(XPlot*(Scale * (X-.5) + CentreX) +
                    DXplot) + ","
            PlotDot$ = PlotDot$ + STR$(YPlot * (CentreY - Scale * Y) +
                    DYplot)+ ";"
            PlotDot$ = PlotDot$ + "PD;PU;"
            PRINT #1,PlotDot$;
            IF LOF(1) > 128 THEN WaitCom
            RETURN
    WaitCom:                        'Don't let COM buffer get too full
            IF LOF(1) > 16 THEN WaitCom
            RETURN

    PlotterTest:                    'Make sure plotter is working
        OPEN "COM1:9600,E,8,1" AS 1
        PRINT #1,"IN; SP1;"
        PRINT #1,"PA0,0;"
        PRINT #1,"LB My karma is cool" + CHR$(3);
        PRINT #1,"PA0,0;SP0;";
        PRINT #1,CHR$(13);
        CLOSE 1
        RETURN

    SetMenu:                        'Set up menu for fractals
        MENU 6,0,1,"Fractals"
        MENU 6,1,1 + ABS(ScreenDisplay),"Screen"
        MENU 6,2,1 + ABS(PlotterDisplay),"Plotter
        MENU 6,3,ABS(PlotterDisplay),"Test Plotter"
        MENU 6,4,1,"Let it Rip"
        MENU 6,5,1,"Get Lost"
        RETURN

    GrabPen:                        'Initialize plotter and grab the pen
        IF NOT PlotterDisplay THEN RETURN
        OPEN "COM1:9600,E,8,1" AS 1
        PRINT #1,"IN;SP1;"
        PRINT #1,"PA0,0;"
        PRINT #1,"LB Lambda X is ";LambX;"  Lambda Y is ";LambY;";" + CHR$(3)
        RETURN
```



it's useful if you aren't sure whether your plotter is set up correctly. When you tell the program to proceed it will ask you for some input values and start coming up with points.

The input values, the co-ordinates of lambda, correspond to the starting point for checking out a section of the Mandelbrot set. The program comes with some sample values plugged into it... you can start with these and experiment with them later on. Because the program remembers the code it's given the next time you go to generate a fractal, you can try one out on the screen and then plot it if you like the look of it.

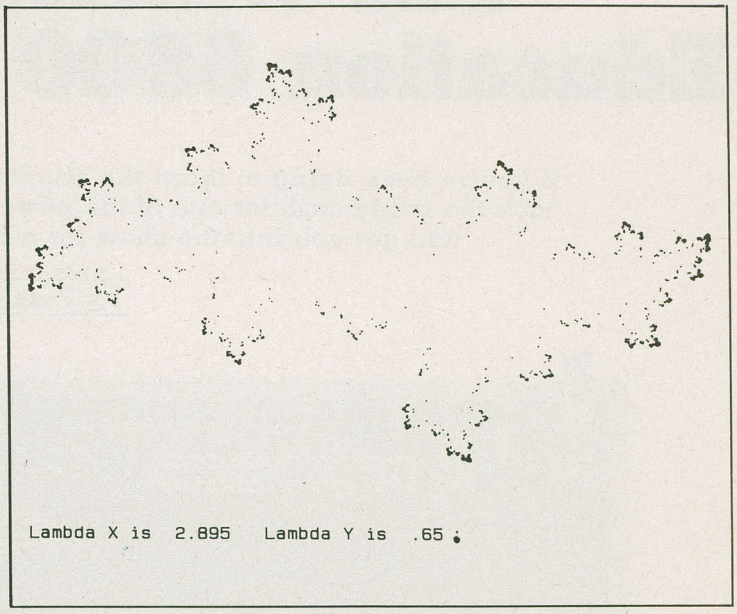
Blue Macs

There is nothing particularly unique about the Macintosh in so far as this program is concerned. In fact, as I mentioned, some of it was developed on an IBM PC. If you excise the MENU, MOUSE and WINDOW code you can easily adapt it to anything that runs BASIC.

Fractal geometry is one of the few really interesting aspects of theoretical math. This may be because of the visual representations which it lends itself to, but, more to the point I think it's because it represents an anomaly in the supposedly ordered and regular cosmos of pure mathematics.

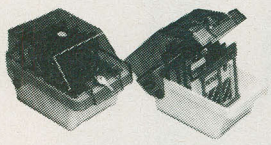
It's fairly easy to get the plotter to do multiple colours, by the way. Even if you don't know an imaginary number from an imaginary pickup truck you can generate some first rate images with fractals. In addition, of course, Microsoft Mac BASIC allows one to capture the images it generates and use them in other applications, like MacWrite and MacPaint.

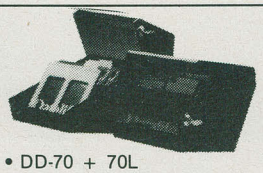
Algebra was never this much fun before computers. **CN!**



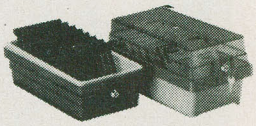
The program running through an HP7475A plotter.

WHY Gentek ?


• GX-50A
• 5 ¼" LIB CASE


• DD-70 + 70L
• 5 ¼" LIB CASE

• DX-100N
•5 ¼' LIB CASE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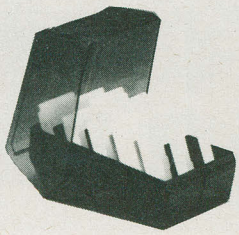
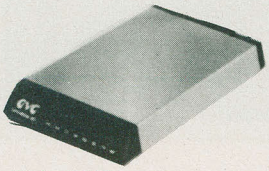
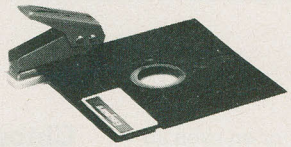
• SS-50A
• 3 ½" LIB CASE


• DD-40 + 40L
• 3½" LIB CASE

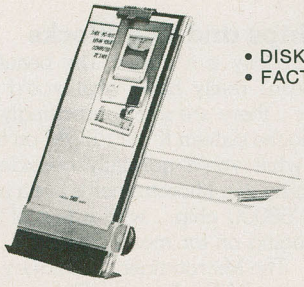
• MS-808
• APPLE/IBM


• GVC 1200B
• 100% HAYES COMPAT

• MS-1000
• APPLE


• DISK NOTCHER
• FACTORY NOTCH

• DT-21
• KEYBOARD DRAWER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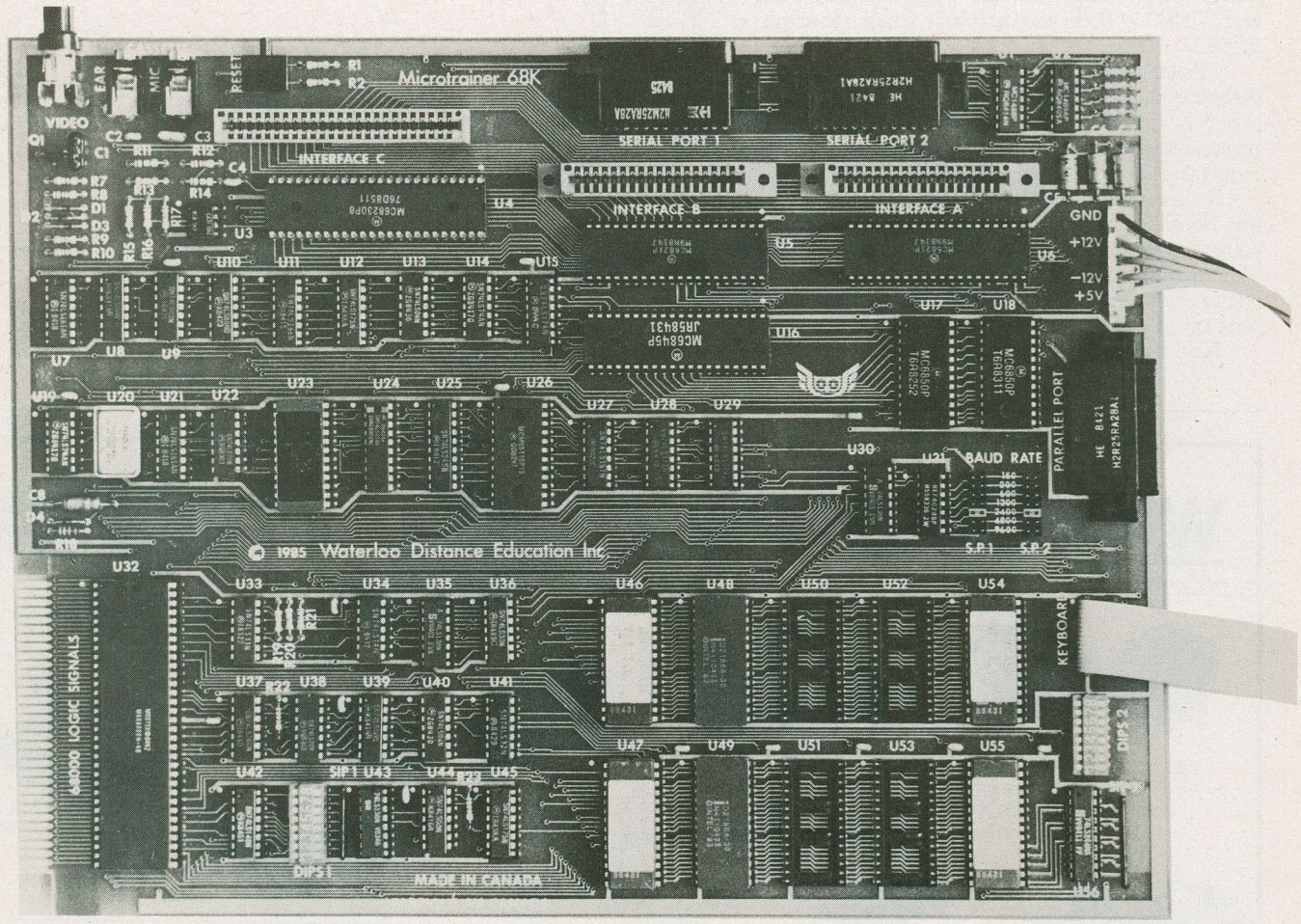
The Waterloo Distance Education 6800 Trainer Review

If you've been dying to learn the secrets of 68000 programming... but seem to lack the ready cash for one of the newer 68000 based computers... this board will get you into the show for a fraction of the admission price.

by Frank Lenk



If you were going to learn to fly a Boeing 747, or an even an F-18 fighter, you might still do well to start out training in a Piper Cub. Well, the Waterloo Microtrainer 68K is definitely the Piper Cub of 68000 based microcomputers. It hasn't got the range or the accommodations of its more advanced siblings, but it can still get you there... and maybe even let you have some fun along the way.

If you're used to thinking of computers in terms of ivory enamelled cabinetry and the whine of hard disks, you'll be a bit aghast at the Microtrainer. It arrives as a raw motherboard, and just lies there with its connectors hanging out until you plug a few peripherals into it.

Chips and Old Blocks

Simplicity is a virtue. The beauty of the Microtrainer is that it doesn't really have what you'd call an operating system. Oh, yes... there are some surprisingly useful routines tucked away inside the sixteen K of EPROM on the board. However, a lot of this is what you'd normally consider to be applications software. Mostly, the Microtrainer is just a naked, unclothed and unvarnished 68000 chip... with a few of its closest friends and relations hanging on for moral support.

The Microtrainer's subsidiary chips provide quite an amazing array of I/O channels. There are two 6850 chips, driving an RS-232 port each. There's a pair of 6821s, driving a parallel

printer port, parallel keyboard and a sixteen bit card edge bus. A 68230 provides two eight bit ports on another card edge connector, as well as a timer, cassette interface and vectored interrupt capabilities. Last... but certainly not least visible... there's a trusty 6845, doing its usual valiant duty as a video display controller.

If all this isn't enough and you feel you really must improvise, rest easy. All of the bus lines of the 68000 itself are available directly, on yet another card edge connector.

Setting up the Microtrainer is childishly simple. You can run a dumb terminal right off one of the RS-232 ports. A still easier method... for those of us who happen to have the appropriate hardware hanging about... is to hook a video monitor to the composite video outlet and hang an Apple compatible keyboard off the appropriate connector. The Microtrainer has quite an affinity for leftover Apple parts. In addition to the keyboard it is also quite happy to accept the business end of any of those ubiquitous oblong Apple clone power supplies.

The software so conveniently provided in ROM proves equally tractable. There are three main sections, a line editor, a two pass native assembler and a debug monitor. Imagine an Apple II without DOS and the BASIC and you'll have a pretty good idea of what this amounts to. Of course, the Microtrainer has better editing than the Apple, but then so does a Sears wristwatch calculator or the average microwave oven.

Monitoring your Progress

The documentation for the Microtrainer is not exactly resplendent, being printed on letter size paper and plastic coil bound between plastic coated covers. There is a rather neat stylized logo of an owl on the front, although it's not clear what this is meant to signify.

Within this book, however, is everything you need to know about programming the Microtrainer 68K. Well, nearly everything.

Our system also came with an original, collector's item Motorola Semiconductor Products chip information booklet. This is packed with fine print and diagrams explaining things like bus arbitration, double bus faults and exception processing. It is not, however, overflowing with patience for the novice 68000 hacker. It does list the instruction set, and you can sort of puzzle your way through... but a highly recommended adjunct to the Microtrainer would be any good book on 68000 assembly language.

The Microtrainer manual is split into several sections. There's a thorough description of the hardware. Then follow reference guides to the three software modules, the monitor, editor and assembler. Following this is an indispensable section, the complete assembly source code for the ROM software. Next comes a depressing stretch of bound in offprints of the technical documentation for all the accessory chips. Finally there's a terse but highly useful memory map and a two page printout of a sample session on the system.

The latter turned out to be perhaps the most useful feature of all. The example provided is all too brief, but it did get me up and running.

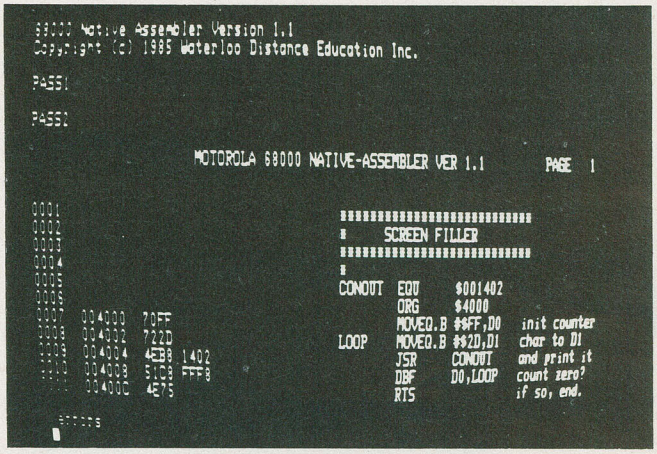
The default Microtrainer environment goes by the cumbersome title of WDE68KMON... the Waterloo Distance Education 68000 Monitor. Upon being powered up, this monster introduces itself and presents you with an angle bracket prompt. It will make quite a few thrills available to your questing fingertips, although you'll have to pore through some paperwork to find out just what they are.

There are no fewer than twenty-five monitor commands, not including variants. There are the memory commands, DM for display memory, MM for move memory, FM for fill memory, and more... all the usual stuff. There's a set of commands for examining and modifying all the 68000 registers, including the program counter, the user stack, the supervisor stack, as well as the eight data registers and eight address registers. If you haven't experienced the 68000 chip at all, you very swiftly find that it's just about overflowing with registers. Fortunately, unlike the 8088, the 68000 is not particularly finicky about how these registers are used.

The monitor also offers some debugging commands, including GO, to jump to an address, CALL to jump subroutine at an address and several others that permit tracing of program execution.

There is also a simple set of I/O commands. Using these you can easily access either a cassette recorder or a printer.

There are two final commands, responsible for getting you out of the monitor environment. You have two choices, these being LEDIT or ASM. There's little point in ASMing until you've LEDITed, so your initial choice is obvious.



Codes

Typing LEDIT, the line editor command, gets you another sign on message, a new prompt... a hyphen... and a whole new set of commands. To begin entering a program you type A, for append. Your cursor moves down to a promptless line and awaits your pleasure. Tabbing is supported, so you may feel free to format print your listing as you enter it. When you're done you type a period on a blank line and the hyphen reappears.

Now you can try another command, either L for list or T, with some line numbers, for type. Then... whoops. Something's wrong... the whole screen fills up with rapidly scrolling garbage. As an afterthought, reading the instructions reveals that "When creating new text it is the user's responsibility to clear the text buffer." This is done by hitting E, for erase, before starting your program. Ah well, back to the old keyboard.

Actually writing code on the Microtrainer involves a remarkably low degree of mumbo jumbo. The assembler doesn't support macros or a lot of the other frills you get on the big systems. For its part, the 68000 demands none of the palaver associated with the 8088, or with MS-DOS. Again the system becomes hauntingly reminiscent of the cozy Apple II. You just shove the instructions in and run them.

In terms of line editing, however, LEDIT is perhaps a bit too reminiscent of the Apple. Actually, there is no editing at all in LEDIT. The best you can do is search and replace, and that in only one line at a time. It's sort of crude, but strangely bearable once you get the knack of it.

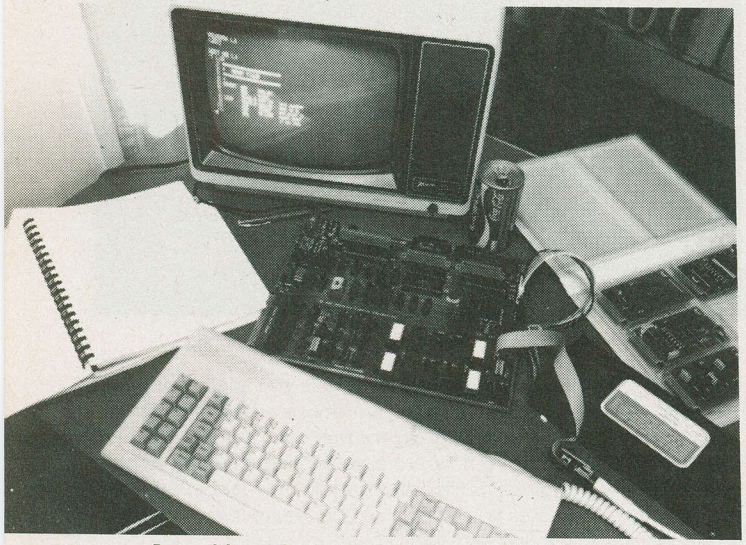
Not surprisingly, the assembler offers only a handful of pseudo ops, and most of those are familiar. There's ORG to set the origin of your object code, EQU the traditional symbol equate, DC and DS to define a data area, with or without initialization and END. The latter is optional, as usual. There are two other odd directives. NAM sets the header title for assembly listings. FWDR is used with an extension, either S or L, to indicate whether you want long or short absolute addressing by default.

Once you've typed in a listing... or, conceivably, loaded it from tape... you'll find that the E command comes back to haunt you. After entering a listing you'll want to get back to the monitor to assemble it. This is done using the command X, for exit.

The Assembly

Eventually I managed to escape from LEDIT with my listing intact. Back in the monitor you can type ASM and be rewarded by an announcement that this is in fact the Waterloo 68000 native assembler. Immediately following the announcement is a blur of assembly code. The assembler announces when it's doing pass one and pass two. Both passes are fast. Yet, again, I was reminded of the Apple, with something like Merlin or the S-C Macro Assembler. It's a marvellous change from the IBM's ponderous MASM.

Chances are you'll get a slew of error codes. These are numbered from one to ten. The explanations are to be found on page forty-three of the manual, and are about what you'd expect... "unidentifiable opcode", "undefined symbol", "illegal addressing mode" and so forth.



Assembly code on the 68000 is amazingly simple, but there are a few hidden pratfalls available for the unwary. Most of the commands are so familiar that one is tempted to take them for granted. This can cause puzzling problems when the commands turn out not to behave exactly as expected. Compounding this problem in the case of the Microtrainer is the fact that Waterloo includes in the system a cross assembler for the PC. Many of the sample course oriented programs were apparently generated on the cross assembler... which has a slightly different syntax to the built in assembler. Typing these programs straight into the Microtrainer turns out to be confusing and futile.

Compared to a simpler chip like the 6502, there is a fairly dazzling assortment of useful opcodes.

Virtually every 68000 opcode appears to have one or two extensions that qualify the exact mode of operation. This seems strange at first, but is really quite handy once you see what's going on. For instance, a simple instruction like MOVE has around a half dozen variants. You can MOVEA, move address, MOVEM, move multiple registers, MOVEQ, move quick... that is, move immediate data... or just plain MOVE. Furthermore, you could MOVEQ.W, move a sixteen bit word, MOVEQ.B, move an eight bit byte, or MOVEQ.L, move a thirty-two bit long word. I suspect there may be defaults available, but I didn't push my luck.

Branching instructions have their own variations, as previously implied by the FWDR assembler directive. Something like a BNE, branch on not equal, could have either an L or an S extension, for long or short branching. The distinction arises, of course, from the need to set aside the right number of bytes for the branch displacement.

Compared to a simpler chip like the 6502, there is a fairly dazzling assortment of useful opcodes. Naturally all the arithmetic expressions are built in. One has ADD, MULS, SUB and even even DIV. Often used combinations are combined into single codes. For instance, DBEQ, DBGT, DBLT and numerous other variants will test a condition and if it is not met, will decrement a counter and loop to a specified label. The most convenient form of this is the DBF instruction, decrement and branch if the condition is false... that is, when the counter register becomes negative. Branching on a negative value is a peculiar provision, implying that the zero'th iteration will be executed. You have to remember to initialize the counter value to one less than the number of iterations you want.

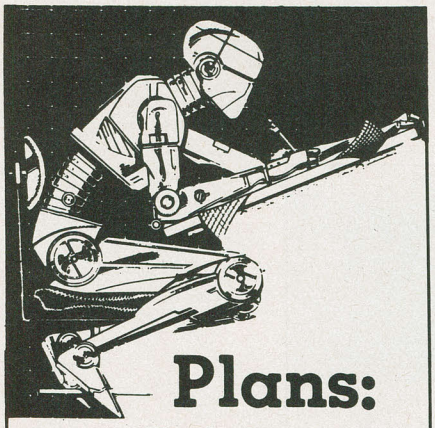
The 68000 is absolutely oozing with addressing modes. Aside from trivial stuff like register direct or register indirect, you get "register indirect with displacement and index", which adds both a specified constant displacement and the contents of another register to the address contained in your actual address register. Then there's "register indirect with predecrement or postincrement". That sounds awful, but in practice it has a very simple function. It lets any part of memory be used as a stack. This can be deduced from the terminology. It will use the address contained in a register, then move the register's address... the stack pointer, in effect... up or down one to accept the next value on the stack.

Some instructions are really new and different. TRAP is somewhat the 68000 equivalent of the 8088 INT interrupt instruction. Hitting a TRAP... deliberately in a program, as an external input, or as a result of a program error... will result in having the program counter and status register shoved onto the system stack. Execution is then vectored away somewhere.

After this one starts to get into some pretty mysterious areas of 68000 lore. Not to worry. You need only grasp some of the basic opcodes before diving right in and producing some working code. Here's an example.

```
►ASM
68000 Native Assembler Version 1.1
Copyright (c) 1985 Waterloo Distance Education Inc.

PASS1

PASS2

     MOTOROLA 68000 NATIVE-ASSEMBLER VER 1.1  PAGE 1

0001                                  PRNMES  EQU     $12B0
0002                                  ORG     $4000
0003  004000  207C 0000 4100          MOVE.L  STR1,A0
0004  004006  4EB8 12B0               JSR     PRNMES
0005  00400A  4E75                    RTS
0006                                  *
0007                                  ORG     $4100
0008                                  STR1    DS.B    128

0 errors
```

This trivial bit of code doesn't do anything too exciting, but it does show most of the things you need to know. The address of



Plans:

System:	**Waterloo Distance 68000 Microtrainer**
Prices:	**$745.00. $895.00 including video circuit $250.00 set of four I/O modules**
Distributor:	**Waterloo Distance Education, P.O. Box 62, Waterloo, Ontario N2J 3Z6 (519) 884-4340**

any arbitrary string is moved into address register A0. Then the program jumps to PRNMES, a built in routine to output a string. The string itself is stuffed into the data area defined at $4100, using the monitor's set command. The string must be terminated with at least one byte of zeroes for PRNMES to react correctly. The complete program as shown is the beginning of a text output facility. That's generally the first thing I like to put together, since without it you tend to get little information on what your programs are doing.

Notice that outside of the long word MOVE instruction, everything else could easily be found in a 6502 assembly listing.

There's a thick wad of programs accompanying the Microtrainer, but most of them are specialized for particular classroom assignments. Most of these in turn are oriented around a selection of peripheral cards that comes with the system. There's a seven segment LED display card, a speaker card, a card with just some rows of LEDS to switch on and off and so on. I didn't mess with these, although working through the example programs it shouldn't be too difficult to get the cards up and running.

If all you want is something to fool around with and maybe run some control applications, the Microtrainer should make a handy little test bed. The system seems to work smoothly together in a way that many clone boards don't. Furthermore, its got the benefit of the splendid 68000 chip. Everything on the machine, from screen refresh to assembling your program, runs like the proverbial bat out of hades. It's a bit like getting your hands on a benzedrine Apple.

Considering the potent interfacing capabilities provided on the board, the Microtrainer could probably even turn into quite a real computer. Of course, you can't really stuff a lot of RAM into it, and I don't know of anybody offering a word processor for it.

However, it should run a mean video game... once you've written one. **CN!**

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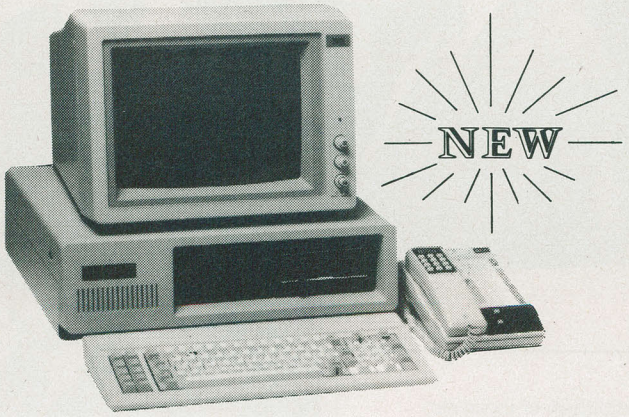

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MEX For CP/M

Modem programs seem to be as much a part of CP/M is are sorted directories and BDOS errors. Here's a look at the ultimate implementation of this powerful facility.

by Steve Rimmer

The evolution of MODEM7 is probably one of those things that historians will be writing papers about after all of us are dead. It doesn't seem like much now, but it surely says something profound about our society. Or, at least, it will.

The earliest implementations of MODEM7 were pretty crude by our standards. They did little more than transfer files, which is, arguably, all one should expect of a file transfer program. However, over the years quite a lot has been added to these things until, at the moment, the source code for a contemporary implementation of one of the great grandchildren of these early packages can run to several hundred kilobytes. The programs themselves are a wealth of features and exotica, being, in effect, little operating systems unto themselves.

The MDM programs, which were... for a while, anyway... the ultimate extension of MODEM7, did almost everything one could ask of a terminal package, edging up on the capabilities of some of the commercial... paid for... software which did much the same stuff. However, like all good code MDM has been surpassed by yet another variation. The MEX packages really blow everything before them out of the water.

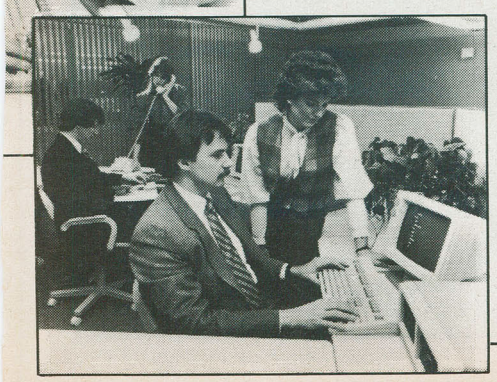
MEX is, in fact, derived from MDM. Nothing is likely to be derived from it because, unlike the previous incarnations of the beast the source code for MEX is not available in the public domain... all you can get is the object file and its overlays. This is unfortunate... so much good stuff happened to software when it was touched by a lot of hands. However, bother not about this. You'll have enough fun with it even if you can't hack with its guts.

Executive Decisions

To begin with, MEX is an acronym for *Modem Executive*. It will serve as a terminal package, among other things, allowing you to call bulletin boards or mainframe computers or anything else you have reason to get on line with. However, its features beyond this are almost supernatural, allowing you to handle areas of telecommunications that almost seem to require custom written software.

MEX will run on virtually any CP/M based computer... but, of course, there's a catch to this. As anyone who has tried to use a lesser version of MODEM7 on a system it wasn't specifically configured for will attest to, the way each computer handles its modem communications is unique. The existence of CP/M in the middle doesn't mitigate things in the slightest. MEX has the same limitation.

Like the MDM programs, all of the system dependent parts of MEX live up in an overlay at the start of the program. As such, rather than having to rewrite MEX for every computer it's to be used on one only needs to change the overlay, replace the first part of MEX with the resultant object code and fly. Perhaps "fly" isn't the ideal word. Developing working overlays can be a tricky and laborious procedure for some systems.



Fortunately for the owners of most of the popular systems, the overlays for MEX are not as much of a problem as they were for MDM. For one thing, most of the overlays for MDM will run with MEX quite well and, MEX having been extant for a while, most of them have been upgraded to completely MEX compatible versions. There are MEX overlays for almost everything that has chips and a screen... and CP/M, of course. Check out table one.

Getting an overlay into MEX isn't dead easy, of course... nothing which has more than four bytes of code ever is... but it's relatively simple if you've done any assembly language programming and have read the instructions that come with the package.

In fact, once one has one's system dependent code installed in MEX one also needs to install a second overlay to handle dialing. The original MDM programs had a dialing section which supported the dialing of SmartModems and the obscure PMMI S–100 based modem card. This was really quite useful... if you happened to have one of these things... but not a lot of help for users of other hardware with different dialing methods.

Many of the resulting MDM overlays contain some rather alarming patches to the MDM dialing code to adapt it to other modems. The MEX situation gets around this by having a complete dialing overlay area. There are overlays for the Hayes SmartModem... and its numerous compatibles... and for the PMMI. If one has something other than these two machines, one can use the overlay code as a basis for writing a custom dialing overlay. This is worlds easier than devising tricky patches to existing object code... although, some would argue, not as much of a challenge.

This brings up a final consideration about overlays, by the way. While I did say that MDM overlays will work with MEX, this is only mostly true. Any overlay which confines itself to the overlay patch area of MDM will serve under MEX. However, as I noted, there are some overlay designs which included patches to the rest of MDM. These won't work under MEX, and will probably hang. If your modem isn't SmartModem compatible... or a PMMI modem card in an S-100 system... and your MDM overlay still manages to dial, you have an incompatible overlay.

Command Performance

The basis of the MEX command structure is similar to that of MDM. However, it is a really vast superset of the earlier MODEM7 implementations, so much so that there is a huge on line help file and a HELP command to run it. It takes about an hour just to go through all the entries and find out what they do, as so many of them are interrelated.

The simplest thing to do when you boot MEX is to go into terminal mode. From this point you can do a number of things by typing the escape character and a letter. These include functions like leaving the terminal mode... useful but a bit premature... and sending and receiving text files through straight ASCII transmission. This mode supports an XON/XOFF protocol.

The escape character, by the way, is a bit of an insight into the basic nature of MEX. You can change this to be anything that's convenient. There's a very fundamental command called STAT which can be used to change any of the system's many variable parameters. Typing STAT ESC "A" would, for example, change the terminal mode escape character to control A.

We'll get into more STAT variables in a second.

As with any program, the settings of the STAT variables of MEX are lost when the program ends... or, at least, they can be. There are actually two ways to save them. The first involves the use of the command CLONE. If you issue this thing it will copy the current version of MEX out of memory and back onto the disk as a COM file... with all of the STAT variables stashed away as you've most recently set them. As such, you can boot MEX, configure it just the way you want it and then blast it back to the disk so that it'll come up that way the next time you run it.

The second way involves the use of READ files. This is one of MEX's freakier facilities... it's sort of like the CP/M SUBMIT function. If you were to type READ WOMBAT... and there was a file called WOMBAT.MEX on your disk with one or more valid MEX commands in it... each of the commands in turn would be executed as if it had been typed at your console. As such, one could have several versions of a READ file to set up the system's STAT variables. Furthermore, there is a STAT variable called INITFILE which, if set and subsequently CLONE'd, will cause MEX to look for the file INI.MEX whenever it boots. As such, one can have it automatically configure itself in this way.

These READ files can, in fact, be used to set up MEX for dedicated tasks as well. It's possible to create an INI.MEX READ file that will handle a whole call session for you... it'll boot up with MEX, call a board, loop 'til it gets a free line, log you on, get to the appropriate file section, download a predetermined file and log you off all without any human intervention. The READ command is an extremely powerful feature of MEX.

There are quite a few other uses of READ files... we'll get into a few of them

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Computer News Today

This months Weather
MIXED
September 1985

UPI Release Crazed Crowd Tramples JMG Compushoppe Staff... Birds-eye-view

JMG Compushoppe OPEN'S
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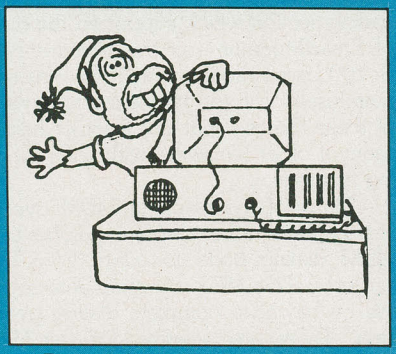

Recovering nicely, the Beaver is back taking orders for JMG's mail order division.

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Circle No. 31 on Reader Service Card.

Table One

This is a partial list of the MEX overlays that were kicking around at the time of this writing.

MXM-CD10.AQM	Concord Data Systems 224AD
MXM-UD10.AQM	UDS 212 A/D modem
MXM-US13.AQM	US Robotics S-100
MXO-AC01.AQM	Apple-Cat || no dialing support
MXO-AD13.AQM	Advanced digital Super-six
MXO-AL10.AQM	Altos series 5
MXO-AP12.AQM	Apple ||
MXO-AP30.AQM	Apple ||, //e Softcard or Apple Super Serial
MXO-CT14.AQM	CTS Companion modem
MXO-DB10.AQM	Dynabyte DB 8/1
MXO-DP10.AQM	Datapoint 1560
MXO-DT10.AQM	DATEC 212
MXO-EP12.AQM	Epson QX-10, external modem only
MXO-GB11.AQM	CompuPro Interfacer 3/4 2661 UART
MXO-H812.AQM	Heath/Zenith H89 8250 UART
MXO-HZ13.AQM	Heath/Zenith Z100
MXO-II12.AQM	InterSystems VIO
MXO-IM11.AQM	Cermetek Info-mate 212A modem
MXO-KP42.AQM	All Kaypros, internal modem or external Hayes
MXO-LO15.AQM	Lobo Max-80
MXO-MD11.AQM	Morrow Micro Decision
MXO-MG10.AQM	Mega Z80 SBC
MXO-MM10.AQM	Morrow Multi-I/O board 8250
MXO-MM2.AQM	Apple || Super Serial Novation J-CAT
MXO-NA1.AQM	NorthStar Advantage
MXO-NE11.AQM	NEC PC-8001A
MXO-NS11.AQM	Northstar Horizon
MXO-OA11.AQM	Otrona Attache
MXO-OC10.AQM	Osborne-1 with COMM-PAC modem
MXO-OS15.AQM	Osborne-1 6850 ACIA
MXO-OX11.AQM	Osborne Executive
MXO-P1-1.AQM	PMC Micromate 101 CP/M+
MXO-PM22.AQM	PMMI S-100 modem
MXO-PR10.AQM	Penril 300/1200 AD and compatibles
MXO-R211.AQM	Tandy TRS-80 II
MXO-RP10.AQM	Tandy TRS-80 4 with CP/M+
MXO-RS13.AQM	Tandy TRS-80 4 With Montezuma CP/M 2.2
MXO-RV13.AQM	Racal-Vadic models VA212 and VA3451
MXO-SB12.AQM	Intertec Superbrain
MXO-SC10.AQM	Novation Smartcat modem
MXO-SM13.AQM	Hayes and Hayes compatible
MXO-SM14.AQM	Hayes, with hardware dependencies
MXO-SY21.AQM	Sanyo MBC-1000
MXO-TV11.AQM	TeleVideo TS-802
MXO-UD10.AQM	UDS 212 A/D
MXO-UR13.AQM	US Robotics S-100
MXO-VP10.AQM	Ventel MD212-Plus auto dial modem
MXO-VTL1.AQM	Ventel with Otrona Attache
MXO-XE12.AQM	XEROX 820 and 820-II Z80 SIO
MXO-Z321.AQM	OSM Zeus 3
MXO-AM10.AQM	Ampro little board SIO and CTC
MXO-DV10.AQM	Davidge DSB-4/6 SBC NEX 7201 MPSC I/O chip
MXO-MW10.AQM	Racal Vadic MAXWELL
MXM-CQ10.AQM	Concord Data sys 224 ARQ/AD
MXO-K484.AQM	Kaypro 4/84 with internal modem
MXO-AL11.AQM	Altos 580
MXO-MC10.AQM	Magic Computer PC-88
MXO-SD10.AQM	Sierra data SBC-100
MXO-VT11.AQM	DEC VT-180
MXO-XE2U.AQM	Xerox 820-II
MXO-ZB11.AQM	Zorba
MXO-AP31.AQM	Apple || Mountain Hardware or PCPI, Hayes modem
MXO-AP50.AQM	Apple //e PCPI, Super serial card, Hayes modem

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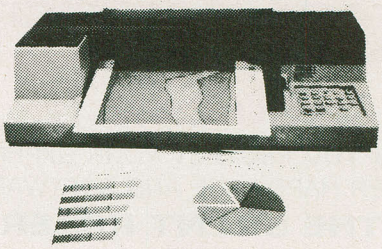

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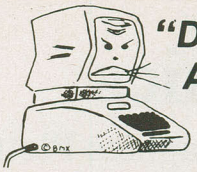

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MEX For CP/M

presently. Much of what can be done with them, however, will be determined by what you want to do with MEX. They just about qualify as a programming language.

The way that MEX handles its phone number library is especially interesting, in that the phone numbers are essentially system variables. If one were to enter PHONE AARDVARK 1-416-423-3262... the word AARDVARK could be replaced with any eight character string, preferably a more meaningful one... the name and phone number would be entered into MEX's memory. You could tack a baud rate specification, such as 1200, onto the end of that. The result of this is that a list of numbers gets built up in the program.

Typing PHONE without any arguments will show the whole list.

MEXico

MEX incorporates virtually all of the really slick things one finds in commercial terminal packages. There is, for example, the facility for defining keystrings. The KEY command allows one to set up any key... except for the ones that are already being used by the system... to spew out the string of your choice when you're in terminal mode. One might have these things hold one's first and last names, useful commands like DIR and TYPE, one's secret passwords and so forth. The keys, once defined, can be saved in the same way that the phone numbers are.

The command SENDOUT is a bit specialized. Typing

```
SENDOUT There once was a hermit named Dave
```

would send the specified string out to the modem. This is primarily useful in READ files, as it allows one to have a file completely control a log on session with canned commands.

There's another useful command in this respect, SLEEP, which causes the system to pause for a specified period of time. As such, one could have a read file command a SmartModem with a sequence like

```
SLEEP 1
SENDOUT +++
SLEEP 1
SENDOUT ATS0=1
```

This sequence would cause the modem to go into an auto answer mode.

If we were to put this sequence in a file called ANSWER.MEX, and type the command STAT EXTEND=ON, the command ANSWER, having these properties, would be added to MEX's command list. In other words, with the EXTEND variable on, any command which MEX doesn't recognize as a native instruction is next tried out as a READ file, although READ doesn't show up on the command line.

Finally, of course, MEX will transfer files. It supports the MODEM7/XMODEM protocol, with a number of STAT variables to allow one to specify exactly how it is to send data. There is, in addition, a module built into the program to do Compuserve protocol transfers. It's enabled with the STAT variable CIS. It can actually be dispensed with entirely if it isn't going to be used, leaving more room for other things.

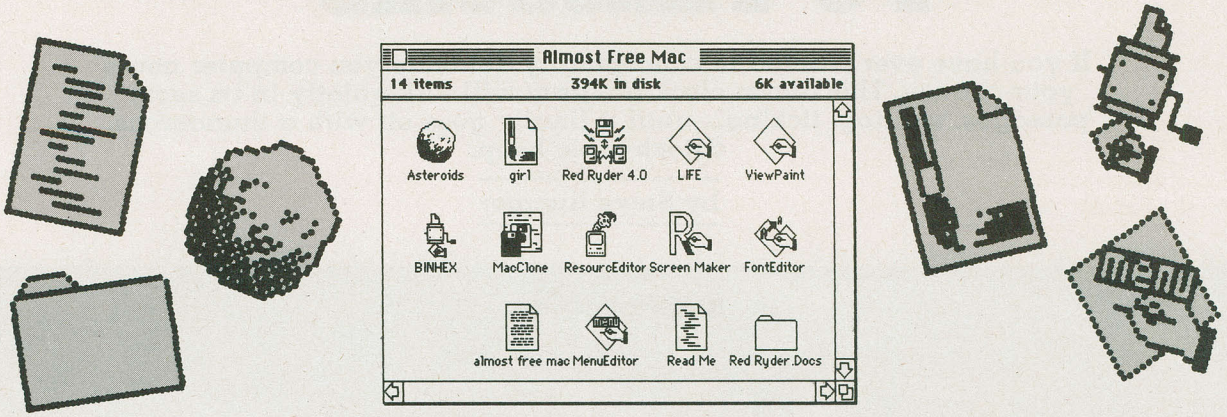
OverByte

There are a lot of things concerning MEX that I haven't talked about here. It's fairly massive, and a proper description of its facilities could easily fill this magazine and crowd out all the ads. The publisher seems to frown on this sort of thing.

The great joy of MEX, of course, is that it's free. It can be had from virtually any RCP/M bulletin board. The only cost involved in MEX is in the time it takes to get its overlay patched and installed... a small price to pay, to be sure.

MEX is unquestionably the slickest MODEM7 implementation in the known cosmos... and it's worth a couple of hours to get going. While it's arguably best suited for the computer *illuminati*, this stratum of Western civilization is about the only group still using CP/M... there's something Darwinian in that. **CN!**

Almost Free Software for the Macintosh



We've had public domain software for the Apple, for CP/M based systems and gallons of it for the IBM PC. After some digging we turned up some equally super stuff for the Macintosh. Some of these programs will blow your socks and some toenails clear off.

This collection consists of almost four hundred K of applications and documentation files. There is something in here for even the most jaded Macintosh user. Feed your mouse now . . . it'll need the energy.

Asteroids This is an implementation of the classic arcade game which is considerably better than most of the ones you lost your life savings in quarters to. The graphics are too splendid to be adequately described with mere words.

Girl Those of us who are quick enough explain this sort of thing as art. The rest call it lechery. However, it's a really well done MacPaint image in any case.

Red Ryder Telecommunications on the Mac has never been this easy. Red Ryder includes the XMODEM and Kermit protocols and lots of other features.

BINHEX A second banana of Red Ryder, this program converts applications files to binary files and back again to allow them to be transferred over phone lines.

Life Life is one of the classic computer programs, and this implementation is exceedingly well done. It simulates micro organisms living and dying . . . and eating each other. Alternately, it might be a parking lot full of Toyotas.

ViewPaint Ever want to check out a MacPaint file in a hurry without getting into MacPaint? This little utility lets you peer at the top bit of a picture with a minimum of overhead and waiting.

MacClone The disk copy routine in the Mac's system disk is a bit barbaric. This is a vast improvement. It even does in some copy protection schemes.

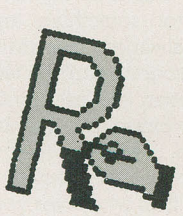
ResourceEditor The icons and other resource items of the Mac just cry out for meddling with. This little tool does it for you.

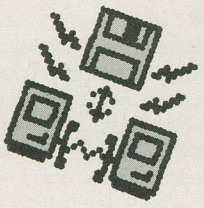
ScreenMaker Moving text from MacWrite to MacPaint can be a bit disappointing . . . something gets lost in the clip board. This utility lets your words make the trip unscathed.

Font Editor For those longing to make their own fonts . . . and for those who just want to adjust the ones they have . . . this application lets you fat bit to your heart's content.

MenuEditor All those words in the Mac's applications can be changed. This is the way to do it.

All of this rather incredible software plus the disk it resides on can be yours for a mere





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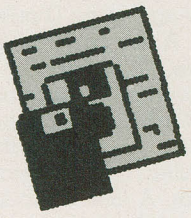


Fine print: All of this software was obtained from public bulletin boards and is believed to be in the public domain. Most of it is freeware . . . the authors would like some money from you. You should probably send them some, but this is between you and your wallet.

We are not charging you for the software, but rather, for our time in collecting, sorting and assembling it, plus the cost of the disk and postage and handling.

We've tested this software pretty thoroughly, and it all seems to work properly. Some of it is capable of hanging the system if it is used incorrectly. Some, like the Resource Editor, will require a degree of knowledge of the insides of the Mac to fully apply it. There isn't much documentation in this area . . . be prepared to have to experiment a bit. We are unable to assist you in applying this software to your specific needs.

This software is supplied without a finder or other system files on the disk. You will have to copy it onto a disk with a system to use it.

PC Timebomb

If you have ever wanted to conceptually detonate you computer now's your chance. This alarm clock program will lurk quietly in its secret passages, waiting, ticking... until it finally goes off with a thunderous, catastrophic beep.

by Steve Rimmer

The whole concept of time is rather more of a convenience than a physical law. This is a very worthwhile headspace when you're late for something and, of course, the manufacturers of cheap Taiwanese disk drives have been promoting it for years. Your program can't be taking forever to load when time itself was disproven late last month.

For those less given to Einsteinian mumbly peg, there is the always popular time warp... you can get these things pretty cheap on dollar forty-four days at Woolco. A good time warp will turn the future into the past whenever you have nothing better to do at the present, make light years look like millimeters and chew up enough D cells to build a medium sized office complex with. A line powered time warp would be convenient, but, of course, a bit nasty if you bent now back to before they discovered electricity bills.

Finally, of course, you can just learn to live with time, illusion that it is. To this end there are things like alarm clocks... filthy machines... digital watches, Rubik's cubes and, of course, time bombs. A time bomb is simply a single purpose time warp. It takes a little bit of now and removes it from any possible later ons.

If you own one of the less expensive IBM PC work alike systems you may have considered applying a time bomb to many of its compatibility problems and other personality quirks... or perhaps quarks. That's not what this article is about. Dynamite is dangerous and not nearly as satisfying as a simple sledge hammer, which can be had without a licence down at Canadian Tire. This feature discusses a program which will allow you to better manage the eccentricities of temporal phenomena whilst blasting away at your computer.

Sound the Alarm

There are a number of unusual ways to run programs on the PC, in addition to the standard approach of simply booting a COM or EXE file. Resident interrupt handlers, as seen in the May 1985 edition of Computing Now!, are certainly among these.

Pretty well everything one does on the IBM goes through a set of interrupt calls. These, in turn, zap through vectors that live at the bottom of the first segment of memory. If you execute an INT 21H call for a DOS function, for example, your program will wind its way through the 21H'th vector in low memory and, from there, up into the airy reaches of DOS.

If we were to change the 21H vector we could have all the INT 21H calls from all the programs the system runs directed to somewhere else. This wouldn't be all that useful... you probably don't have any burning desire to rewrite MS-DOS either... but it does illustrate what's happening with these things.

It's possible to write a program which, once loaded, stays in memory and doesn't get trampled on by any subsequent programs. It's fairly simple... one simply ends the program with the code

```
LEA     DX END OF PROGRAM
MOV     AX.CS
MOV     DS.AX
INT     27TH
```

```
                COMMENT         _

                Timebomb for the IBM PC
                Copyright (c) 1985ad
                Steve Rimmer

                This program is dedicated to the memory of
                Clarence P. Backslash, the only IBM employee
                ever to be publicly executed for owning a
                green tie.

                                _

VERS            EQU     1               ;VERSION
SUBVERS         EQU     7               ;SUBVERSION

CR              EQU     13              ;CARRIAGE RETURN
LF              EQU     10              ;LINE FEED

SECS            EQU     1               ;SECONDS BETWEEN UPDATES
POSIT           EQU     68              ;POSITION ON SCREEN FOR TIME
ATRB            EQU     15              ;ATTRIBUTE FOR TIME
FCHR            EQU     13              ;CHARACTER TO SAY ALARM IS SET
PORT_B          EQU     61H             ;SPEAKER PORT

;THIS IS A VERY UNCOOL WAY OF SETTING VECTORS BUT IT'S
;NEEDED FOR COMPATIBILITY WITH DOS 1.0

SCRNSTAT        SEGMENT AT 0H
                DD      1CH DUP(?)      ;IGNORE FIRST 70H VECTORS
INTF            DW      1 DUP(?)        ;CODE ADDRESS
INTS            DW      1 DUP(?)        ;CODE SEGMENT
SCRNSTAT        ENDS

CODE            SEGMENT PUBLIC  'CODE'
                ASSUME  CS:CODE,DS:SCRNSTAT,SS:CODE
                ORG     100H

SEETIME:        JMP     SET_VECTOR      ;HOP OVER THE RESIDENT CODE

PRINT_TIME      PROC    NEAR
                PUSH    DS              ;SAVE DATA SEGMENT
                PUSH    AX              ;SAVE AX

                MOV     AX,CS           ;MAKE DATA SEGMENT
                MOV     DS,AX           ;LOCAL CODE SEGMENT

                MOV     [STKPNT],SP     ;SAVE OLD STACK POINTER
                MOV     [STKSEG],SS     ;AND SEGMENT

                CLI                     ;DISABLE INTERUPTS
                MOV     SP,OFFSET STACK ;MAKE LOCAL STACK
                MOV     SS,AX
                STI                     ;RESTORE INTERUPTS

                PUSH    ES
                PUSH    BP
                PUSH    DS              ;SAVE REGISTERS
                PUSH    AX              ;WHICH MIGHT GET
                PUSH    BX              ;GORCHED
                PUSH    CX
                PUSH    DX
                PUSH    DI
                PUSH    SI

                INC     [COUNTER]       ;BUMP UP COUNTER
                MOV     AX,[COUNTER]    ;SEE IF IT'S TIME TO
                CMP     AX,18 * SECS    ;DO SCREEN UPDATE
                JNE     EXIT            ;IF NOT, WE DONE

                MOV     AX,CS           ;MAKE EXTRA SEGMENT EQUAL
                MOV     ES,AX           ;CODE SEGMENT
                MOV     DS,AX           ;AND DATA SEGMENT, TOO

                CALL    TIME            ;SHOW THE TIME

                MOV     [COUNTER],0     ;ZERO COUNTER

EXIT:           POP     SI
                POP     DI
                POP     DX              ;GET THE REGISTERS
                POP     CX              ;BACK, JACK
                POP     BX
                POP     AX
                POP     DS
                POP     BP
                POP     ES

                CLI
                MOV     SS,[STKSEG]     ;RESTORE OLD STACK
                MOV     SP,[STKPNT]
                STI

                POP     AX
                POP     DS              ;LAST FEW POPS

                IRET                    ;AND RETURN

;SEVERAL FIXED STORAGE THINGS GO HERE

STKSEG:         DW      0000H   ;STASH FOR STACK SEGMENT
STKPNT:         DW      0000H   ;STASH FOR STACK POINTER
CURPOS:         DW      0000H   ;STASH FOR CURSOR POSITION
CURSZE:         DW      0000H   ;STASH FOR CURSOR SIZE
COUNTER:        DW      0000H   ;UPDATE COUNTER

SNOZE:          DB      ' : : '     ;BUFFER FOR CURRENT TIME
;
FLAG:           DB      ' '         ;BUFFER FOR TIMEBOMB FLAG
ALARM:          DB      '       '   ;BUFFER FOR DETONATION TIME ARGUMENT
                DB      128 DUP(0)      ;ALMOST CERTAINLY TOO LARGE
STACK:          DW      0000H           ;LOCAL STACK (RAM'S CHEAP)

PRINT_TIME      ENDP

TIME            PROC    NEAR
                CALL    CLOCK           ;GET THE CLOCK VALUE

                MOV     BX,OFFSET SNOZE
                MOV     AL,CH
                CALL    DIGIT           ;STASH HOURS
                MOV     AL,CL
                CALL    DIGIT           ;STASH MINUTES
                MOV     AL,DH
                CALL    DIGIT           ;STASH SECONDS
                CALL    POKE            ;SHOW THE TIME ON THE SCREEN
                CMP     [FLAG],FCHR     ;SEE IF THERE'S AN ACTIVE DETONATION
                JNE     NOTIME          ;TIME

                CLD
                MOV     SI,OFFSET SNOZE
                MOV     DI,OFFSET ALARM
                MOV     CX,8
REPE            CMPSB                   ;DO STRING COMPARE OF TIMES
                JNZ     NOTIME

                MOV     [FLAG],' '      ;IF THEY MATCH, ZAP FLAG
                CALL    WAKEUP          ;AND SOUND REVELIE

NOTIME:         RET
TIME            ENDP

WAKEUP          PROC    NEAR            ;PLAY A TUNE
                MOV     BX,OFFSET SONG  ;POINT TO TUNE

WAKE1:          MOV     AX,[BX]         ;GET TUNE NOTE
                MOV     [PITCH],AX      ;STASH IT
                CMP     AX,0            ;IF IT'S DONE
                JE      WAKE2           ;SCRAM
                CALL    BEEP            ;OTHERWISE, PLAY IT
                INC     BX              ;POINT TO
                INC     BX              ;NEXT NOTE
                JMP     WAKE1           ;AND LOOP
WAKE2:          RET

PITCH:          DW      48H             ;CURRENT NOTE BUFFER

SONG:           DW      48H             ;THE NOTES TO BE PLAYED...
                DW      30H             ;CHANGE THESE IF YOU WANT TO...
                DW      22H
                DW      48H
                DW      56H
                DW      22H
                DW      00              ;DON'T CHANGE THIS ONE
WAKEUP          ENDP
BEEP            PROC    NEAR            ;BIOS BEEP PROCEDURE
                PUSH    AX              ;SAVE THE REGISTERS
                PUSH    BX
                PUSH    CX
                MOV     BX,0C0H         ;LENGTH OF THE TONE
                IN      AL,PORT_B       ;GET THE CONTROL STATUS
                PUSH    AX
BEEP1:          AND     AL,0FCH         ;SET THE 8255 OUTPUT PORT
                OUT     PORT_B,AL       ;SEND OUT THE DATA
                MOV     CX,[PITCH]
BEEP2:          LOOP    BEEP2           ;SPEAKER IS OFF
                OR      AL,2            ;TURN ON THE SPEAKER
                OUT     PORT_B,AL       ;SEND OUT TO 8255
                MOV     CX,[PITCH]      ;SETUP THE ON TIME
BEEP3:          LOOP    BEEP3           ;WAIT HERE UNTIL THIS PORTION DONE
                DEC     BX
                JNZ     BEEP1           ;DO IT AGAIN
                POP     AX              ;RESTORE THE AX REGISTER
                OUT     PORT_B,AL       ;OUTPUT THE INITIAL STATUS
                POP     CX              ;RESTORE THE REST OF THE REGISTERS
                POP     BX
                POP     AX
                RET                     ;EXIT TO CALLER
BEEP            ENDP

POKE            PROC    NEAR
                PUSH    ES              ;SAVE EXTRA SEGMENT
                MOV     AX,0B800H       ;SET ES (B000 FOR MONOCHROME CARD)
                MOV     ES,AX           ;SET EXTRA SEGEMENT TO POINT TO SCREEN
                MOV     BX,OFFSET SNOZE
                MOV     CX,10           ;10 BYTES TO SHOW
                MOV     DI,POSIT * 2
POKLP:          MOV     AL,[BX]         ;GET THE BYTE
                MOV     AH,ATRB         ;ADD THE ATTRIBUTE
                MOV     ES:[DI],AX      ;STASH IT IN MEMORY
                INC     BX
                INC     DI
                INC     DI
                LOOP    POKLP
                POP     ES
                RET
POKE            ENDP

DIGIT           PROC    NEAR
                PUSH    CX
                PUSH    DX              ;SAVE REGS
                MOV     AH,0
                PUSH    AX              ;SAVE VALUE
                MOV     CL,10
                IDIV    CL              ;DEVIDE BY TEN
                PUSH    AX              ;SAVE IT
                ADD     AL,'0'          ;ADD ASCII OFFSET
```

```
                CALL    PRINT           ;SHOW IT
                POP     AX              ;GET IT BACK
                MOV     CL,10
                IMUL    CL              ;MULTIPLY BY TEN
                MOV     DX,AX           ;GET IT IN DX
                POP     AX              ;GET BACK ORIGINAL VALUE
                SUB     AX,DX           ;DIFFERENCE IS ONES
                ADD     AL,'0'          ;ADD OFFSET
                CALL    PRINT           ;SHOW IT
                INC     BX
                POP     DX
                POP     CX
                RET
DIGIT           ENDP

PRINT           PROC    NEAR            ;PRINT CHARACTER IN AL
                MOV     [BX],AL
                INC     BX
                RET
PRINT           ENDP
CLOCK           PROC    NEAR
;       This routine simulates INT 21H, AH=2C
;       It returns with the hours in CH, minutes in CL
;       and the seconds in DH, derived from the absolute
;       timer tick count.
                MOV     AX,0000
                INT     1AH             ;GET NUMBER OF TICKS
                MOV     AX,CX
                MOV     BX,DX
                SHL     DX,1
                RCL     CX,1
                SHL     DX,1
                RCL     CX,1
                ADD     DX,BX
                ADC     AX,CX
                XCHG    DX,AX
                MOV     CX,0E90BH
                DIV     CX
                MOV     BX,AX
                XOR     AX,AX
                DIV     CX
                MOV     DX,BX
                MOV     CX,00C8H
                DIV     CX
                CMP     DL,64H
                JC      NOCRY
                SUB     DL,64H
NOCRY:          CMC
                MOV     BL,DL
                RCL     AX,1
                MOV     DL,00
                RCL     DX,1
                MOV     CX,003CH
                DIV     CX
                MOV     BH,DL
                DIV     CL
                XCHG    AL,AH
                MOV     DX,BX
                XCHG    CX,AX
                RET
CLOCK           ENDP

END_PRINT_TIME:                 ;END OF RESIDENT ROUTINE

SET_VECTOR:     MOV     BX,005DH
                MOV     AL,[BX]
                CMP     AL,' '          ;CHECK FOR ARGUMENT
                JNE     GOFORIT         ;IF IT'S NOT THERE
                MOV     DX,OFFSET MENU  ;SHOW THE MENU AND SPLIT
                MOV     AH,9
                INT     21H
                JMP     QUIT

GOFORIT:        PUSH    DS              ;SAVE DATA SEGMENT
                XOR     AX,AX           ;MAKE AX
                PUSH    AX              ;POINT INTO THE
                MOV     AX,SCRNSTAT     ;SEGEMENT WITH THE VECTORS
                MOV     DS,AX           ;AND MAKE IT THE DATA SEGMENT

                MOV     SI,[INTF]
                MOV     ES,[INTS]
                MOV     AL,ES:[SI]
                CMP     AL,0CFH         ;IS THE PROGRAM CURRENTLY INSTALLED?
                JNZ     CLOCKON

                CLI                     ;KEEP INTERUPTS AT BAY
                LEA     AX,PRINT_TIME   ;POINT TO OUR HANDLER
                MOV     INTF,AX         ;AND PUT POINTER IN TABLE
                MOV     INTS,CS
                LEA     DX,END_PRINT_TIME
                STI                     ;RESTORE INTERUPTS
                POP     AX
                POP     DS

                CLD
                MOV     AX,CS
                MOV     DS,AX
                MOV     ES,AX

                MOV     SI,0082H        ;MOVE ARGUMENT INTO PROGRAM
                MOV     DI,OFFSET ALARM
                MOV     CX,8
REP             MOVSB

                MOV     [FLAG],FCHR

                INT     27H             ; TERMINATE BUT STAY RESIDENT

CLOCKON:        MOV     AL,FCHR         ;IF YES, TURN ON FLAG

                MOV     SI,OFFSET FLAG          ;POINT TO FLAG IN RESIDENT CODE
                MOV     ES:[SI],AL              ;INSTALL NEW FLAG

                CLD
                MOV     AX,CS
                MOV     DS,AX

                MOV     SI,0082H
                MOV     DI,OFFSET ALARM
                MOV     CX,7
REP             MOVSB

QUIT:           INT     20H                     ;BACK TO DOS - NOT RESIDENT

MENU:           DB      CR,LF,'----    Timebomb for the IBM PC version '
                DB      VERS+'0','.',SUBVERS+'0','    ----'
                DB      CR,LF,'          Copyright (c) 1985ad Steve Rimmer'
                DB      CR,LF,LF,'TIMEBOMB <time> sets the alarm'
                DB      CR,LF,'       e.g., TIMEBOMB 01:45:00'
                DB      CR,LF,LF
                DB      '"There is no need to sweat until the ticking stops."'
                DB      CR,LF,'$'
CODE            ENDS
                END     SEETIME
```

This tells DOS that the current code segment is spoken for, and that the next program should load into some other space.

If we were to warp one of the interrupt vectors to point to resident code like this we could have an INT call do something other than what it was intended to do.

The INT 1CH call is unique in that it is automatically thrown by DOS eighteen times a second whether you want it to be or not. In the normal status of DOS its vectors point straight to an IRET instruction, so it never does anything. However, as we'll see here, this thing can be used whenever you want a program to run independent of DOS's tasks and handle something in the background.

Screen clocks are a natural application for the 1CH vector, as we saw in the May article. It's fairly simple to write a small program that causes the current time to be printed up in the upper right corner of the screen every time the 1CH interrupt is hit by the machine. One would change the 1CH vector to point at the appropriate code which would, whenever it was called, save all the affected registers to the stack, read the current time, print it to the screen, get the registers back and return from the interrupt. So long as we're careful not to disturb anything, this can go on without affecting the program the PC is running at the time.

The *TimeBomb* program is a basic interrupt driven clock with an alarm built in. You would use it like this:

```
A►TIMEBOMB 12:00:30
```

This would set up the clock on the screen but, in addition, it would also set up thirty seconds past twelve in a buffer within the program. When the system time matches the buffered time the program will sound an alarm. To make the whole works still more slick and high tech there's a flag that shows up on the screen when the alarm is set and goes away after it's been sounded.

You can reset the alarm to a new time before or after it has gone off by simply running the program again.

This is all extremely useful if you are of a space that finds itself suddenly looking up from your tube and wondering what month it's gotten to be all of a sudden.

Springs and Gears

Despite its rather esoteric operation, there isn't a lot that's really weird about the operation of *TimeBomb* once you understand what it's supposed to do. However, one of the unusual things about the program is that it does two very different things depending on whether it has already been run once before.

If you were to run a simple clock program, such as the one in the May article, multiple times, each successive running would gobble up another chunk of memory. This is because DOS can't know that the resident program you are loading in duplicates the function of a previously loaded one and, as such, simply goes ahead and protects more memory for it.

As *TimeBomb* is designed to be run multiple times, it's important that it only try to load itself in once. In order to be able to do this it has to know whether it is already resident.

If there is no handler for the 1CH interrupt that makes the *TimeBomb* program go, this set of vectors will point to an IRET instruction somewhere in RAM. This is a single byte instruction with a value of 0CFH. Thus, *TimeBomb* can tell if it's already in place by getting the byte where the vectors point and seeing if it's 0CFH.

If the byte is an IRET, the program will change the vectors to point to itself... 0103H of the current sector... and end with an INT 27H to stay resident. If, however, the byte is something else it will simply locate the original version of itself and load in a new alarm time.

This, too, is a bit sneaky. We know that the original *TimeBomb* will start at 0100H in the code segment that was current when it was run. The subsequent *TimeBomb* starts at the same address in *its* code segment. As such, we can make it find the ALARM buffer by simply taking the offset of its own buffer and applying it to the segment of the original version. It can find the segment by looking at the first word in the 1CH vector.

It's karmic how all these things work out.

Another sort of unusual aspect of the program is the mechanism of getting the time printed on the screen. In the original May version we moved the cursor up, printed the time and restored the original cursor position each time the program wanted to update its display. This is slow and a bit sleazy, even if it is the proper way to handle such things.

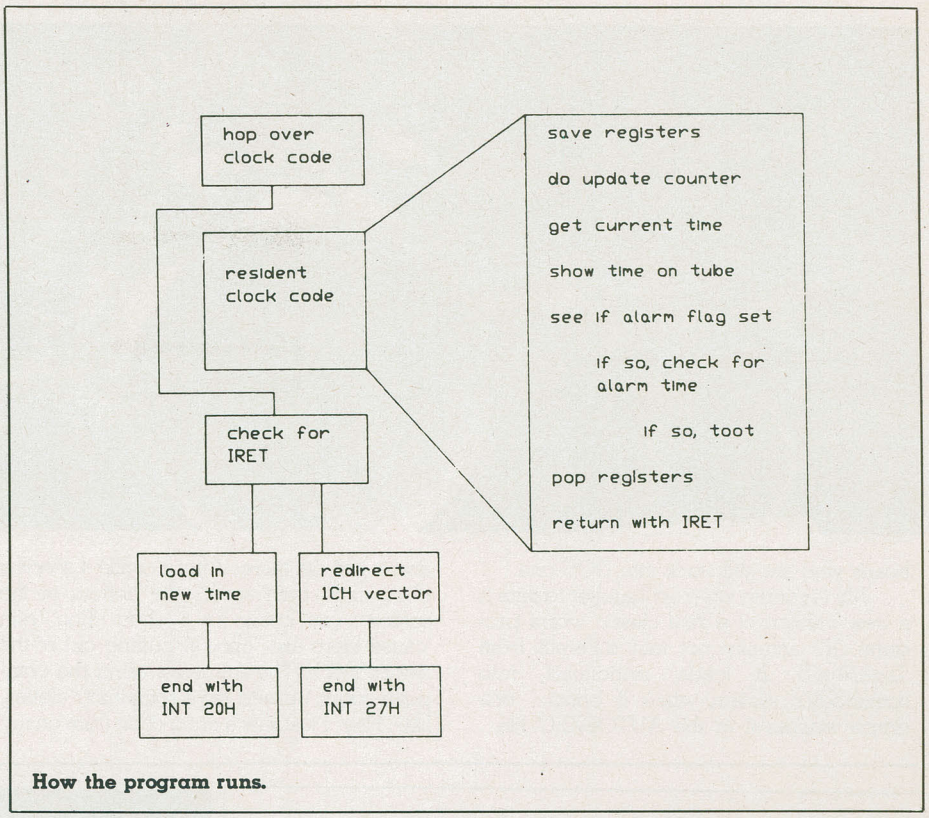
A much better way to print for an application like this is to POKE data into the screen memory. This has an number of advantages. It's much faster than printing and it doesn't disturb the current cursor position or setting of the program that's running in the foreground. On the other claw, it does create some video snow on the displays of some systems and it requires that the program be altered slightly if you want to use it with a monochrome monitor.

Yes, I know, the program itself could do that. One can't write in all the options or there'd be nothing to hack with. Check out the first MOV in the POKE procedure.

Most of the rest of *TimeBomb* works pretty well as did the simple clock in the May Computing Now!. It'll print you a menu of its commands if you try to run it with no command line argument.

Hooks

It's fairly simple to get interrupt handlers like this together once you have the basic form together. In fact, it's even easier than this if you are running DOS version two, as there are calls to get and set the vectors programmatically. I haven't used them here as it would make the program a bit hard on



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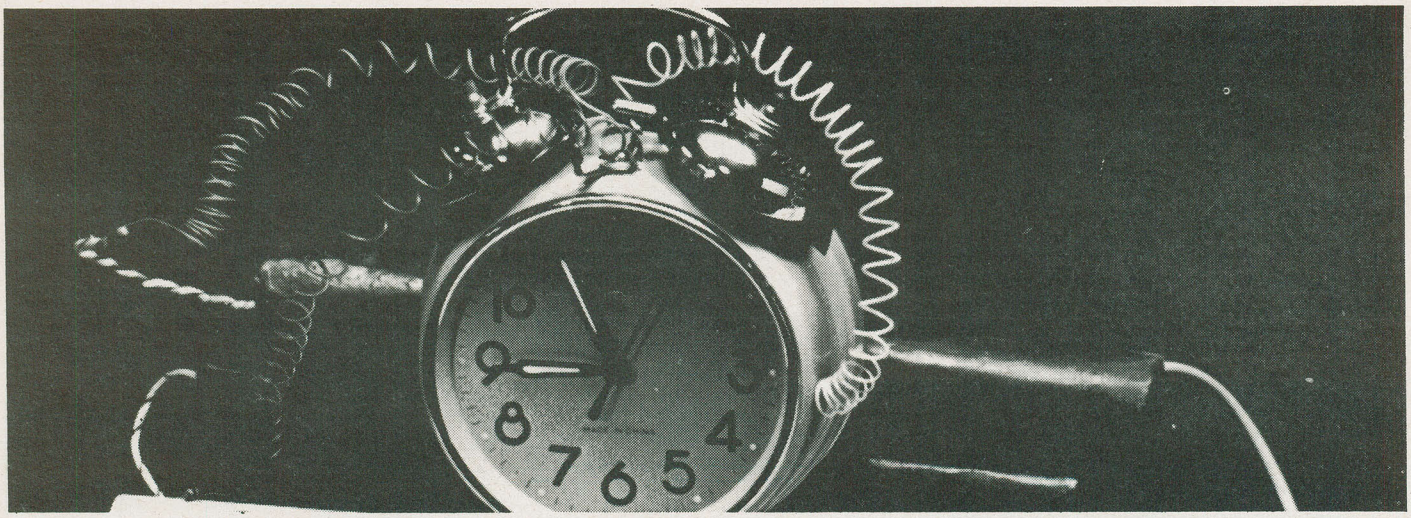

heads who are still stuck into DOS one.

My favourite interrupt handler to date is a new version of a real classic worm program. It's actually not that different from *TimeBomb*. It loads, unnoticed, into somebody's system when it boots... one simply stashes it in the AUTOEXEC file... and it just sits there. After a while it sends a choo choo train across the bottom of the screen. You know it's a choo choo train 'cause there are "choo's" puffing out of the smoke stack. The suit that's using the computer looks up and says something clever, like "Hey, I just saw a choo choo train on my screen." By this point, of course, the thing has chugged clear off the right hand side of the screen.

People look at those guys a little funny after a while if they keep recounting experiences like this. **CN!**

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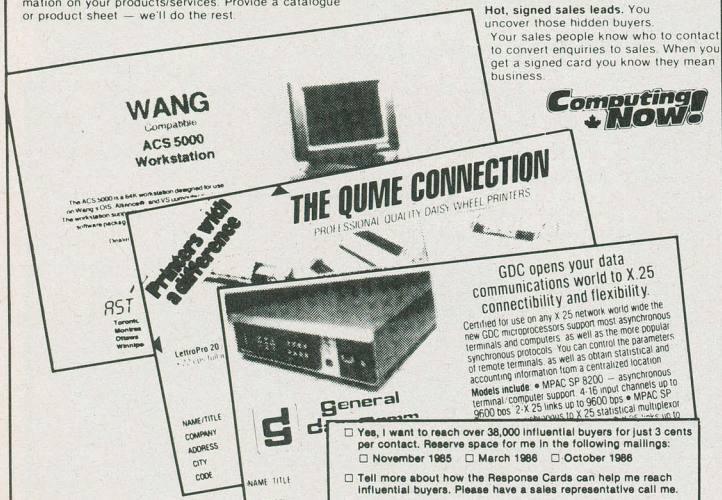

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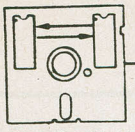

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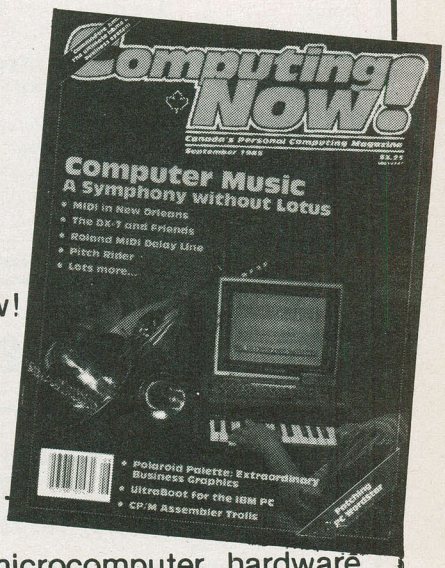

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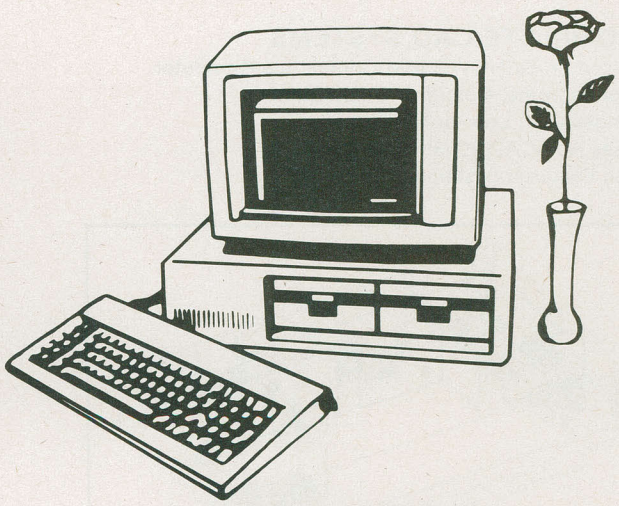

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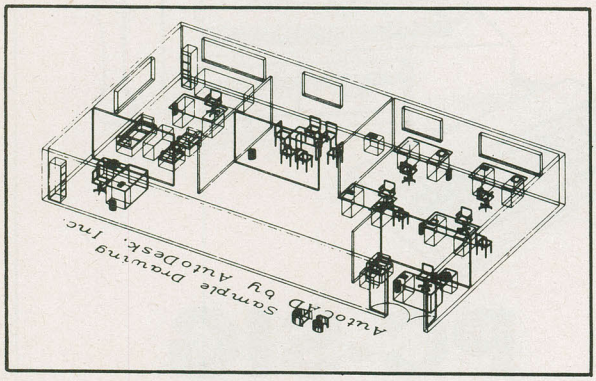

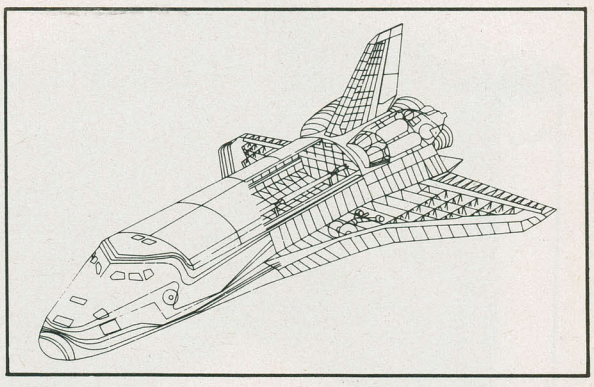

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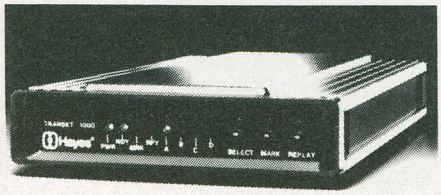

The Transet 1000 comes with two serial ports and one parallel/serial port, and requires a modem for communications. With a list price of $613.00 Canadian, it's available from Compuserve, 400 Alden Road, Markham, Ontario L3R 4C1, telephone (416) 477-8088.

● Also available from Compuserve is the *Taxan* **line of colour graphics monitors.** Models 121 and 122 are super-high resolution monochrome display monitors which are fully compatible with IBM TTL monochrome display, are IBM PC/XT plug-compatible, and are compact and lightweight. Model 440 is a 12 inch RGB monitor specifically designed to upgrade IBM compatible computers, and has 720 by 400 line resolution and a 4000 character display.

Model 121 lists for $292.00, Model 122 for $307.00, and Model 440 for $1,228.00, all Canadian dollars.

Amiga

Tecmar of Solon, Ohio is bringing out a **complete family of products for the Commodore Amiga**, to be available in October of this year. The T-card will add up to one megabyte of memory, a clock/ calendar with battery backup, a serial port, a parallel printer or SASI port and additional power supply. Connecting to the T-card's SASI port, the three and a half inch T-disk will add twenty megabytes and an equal amount of backup will be available with the stand alone T-tape. For communications, the T-modem is Hayes-compatible with selectable 300, 1200 and 2400 baud rates.

These and other Tecmar products will be available from EMJ Data Systems, 291 Woodlawn Road West, ³3, Guelph, Ontario, N1H 7L6, telephone (519) 837-2444.

Also for the Amiga, *Lattice Incorporated* has recently signed an agreement with Commodore to produce the **C language compiler** for the new Commodore Amiga. Commodore will publish, market and support this compiler under the name of Amiga C. Lattice will also offer various cross compilers for developers of Amiga applications software, allowing programmers to take advantage of the speed and structure of larger multi-user systems to develop or port their packages to the Amiga.

Lattice Incorporated can be reached at P.O. Box 3072, Glen Ellyn, Illinois, 60138, or by calling Steve Hersee at (312) 858-7950.

● Rags to Riches, the RAM based, **integrated small business accounting software series for the Amiga** from *Chang Labs* will be available shortly. The four module package, including general ledger, receivables, payables and sales, will be marketed and sold by Commodore directly through its dealers, with retail price yet to be set. Currently, each module sells for bet-

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ween two hundred and two hundred fifty dollars American for other computers.

For further information, Canadian prices and availability, contact Commodore Business Machines, Customer Support Department, 3370 Pharmacy Avenue, Agincourt, Ontario M1W 2K4, telephone (416) 499-4292.

Software Link Up

Two products from *The Software Link* are now available in Canada.

The PC-Shadow offers the features of a full-blown IBM PC for a fraction of the cost. Supporting the same graphics as the IBM, and using the familiar keyboard, the **workstation** was designed to be used with MultiLink Advanced, and LANLink, allowing up to eight PC-Shadows to be connected to a single IBM PC, XT or AT for the sharing of peripherals.

The above-mentioned **MultiLink Advanced software** has recently been upgraded to the 3.02 version, featuring support for PC-DOS 3.1, the potential to expand memory above 640K, 8087/80287 the software's print spooler.

The PC-Shadow is available for under fifteen hundred dollars Canadian, and MultiLink Advanced 3.02 for $745.00, from The Software Link Incorporated, 400 Esna Park Drive, Suite 18, Markham, Ontario L3R 3K2.

Big Blue Business Software

Previously only configured for minis, *Jonas and Erickson Software Technology* has released their **line of business management and accounting systems** for IBM PC ATs and XTs. The series of packages includes Hospitality Systems, Construction Systems, Property Management/Development Systems, Manufacturing and Distribution Systems and a General Accounting System.

As value-added resellers for the IBM PCs, Jonas and Erickson Software Technology Systems Consultants now provide total turnkey system installations, running between twenty-five thousand dollars for an XT system, and thirty-five for the AT. The software alone is between fifteen and twenty-five thousand, depending on the hardware configuration to be used.

For more information, contact them at #700-235 Yorkland Boulevard, Toronto, Ontario M2J 4Y8, telephone (416) 491-6620.

Winner

The winner of the third Computing Now! give away was Joe Trivers of Toronto. He's the proud owner of a Minolta Maxxum thirty five millimeter camera. He correctly identified all six of the photographs. For the curious, they were:

1. Part of a keyboard
2. A DB-25 connector
3. An RJ-11 plug
4. A set of DIP switches
5. The bottom of a Macintosh mouse
6. The middle of a three and a quarter inch disk.

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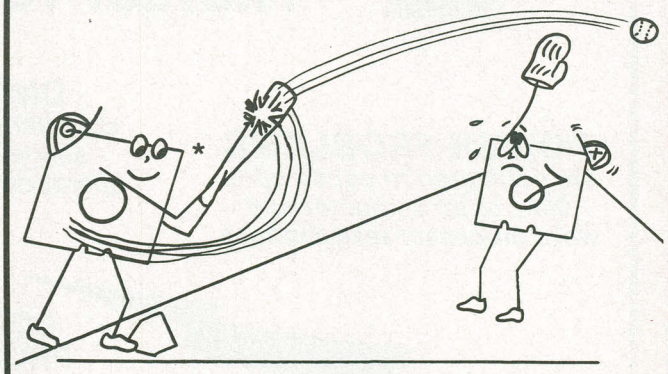

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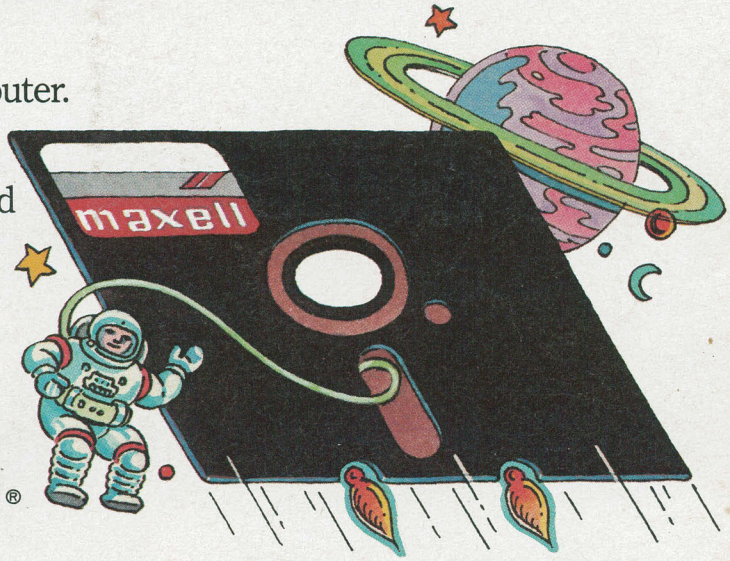

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